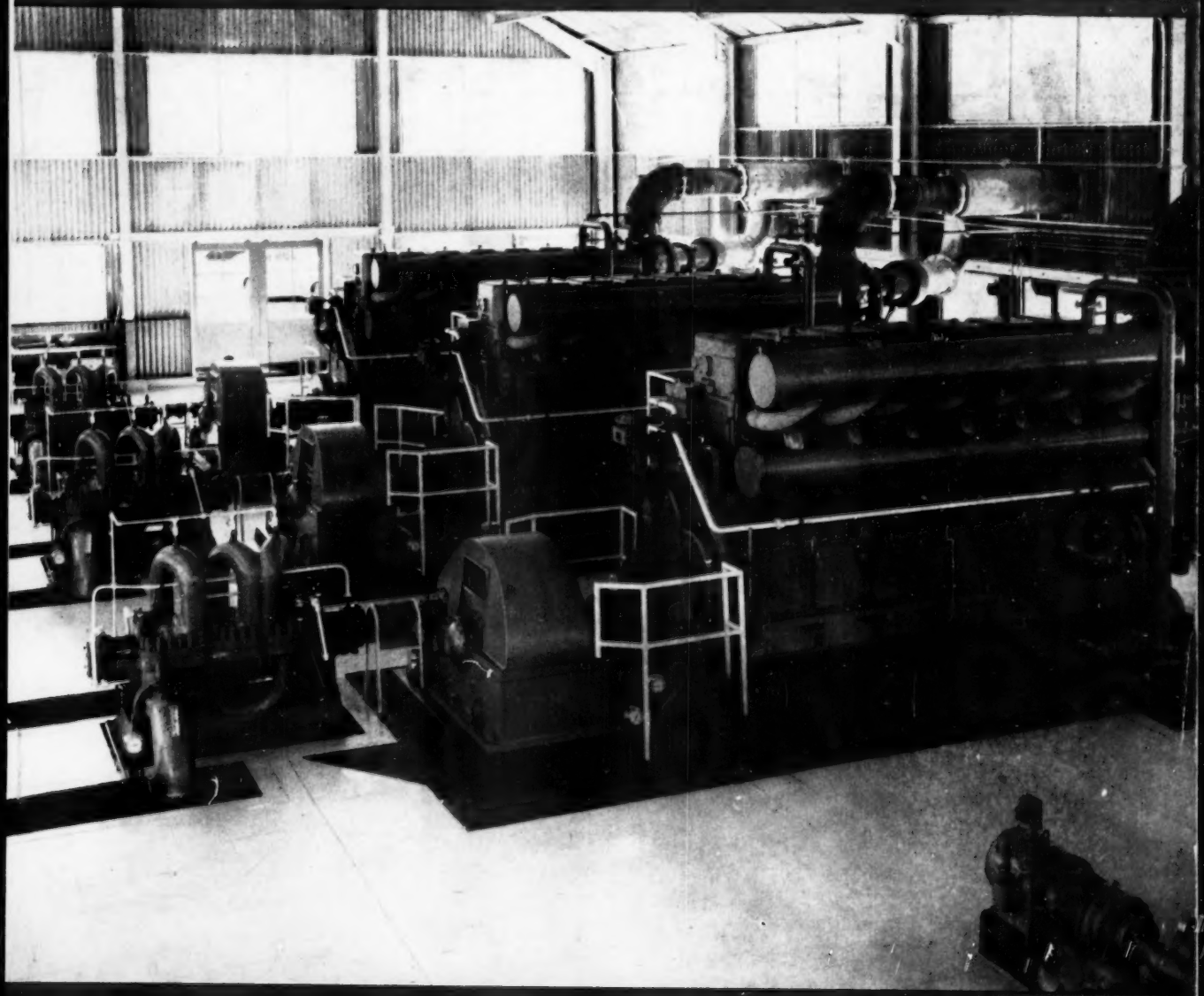
Diesel Power

& Diesel Transportation

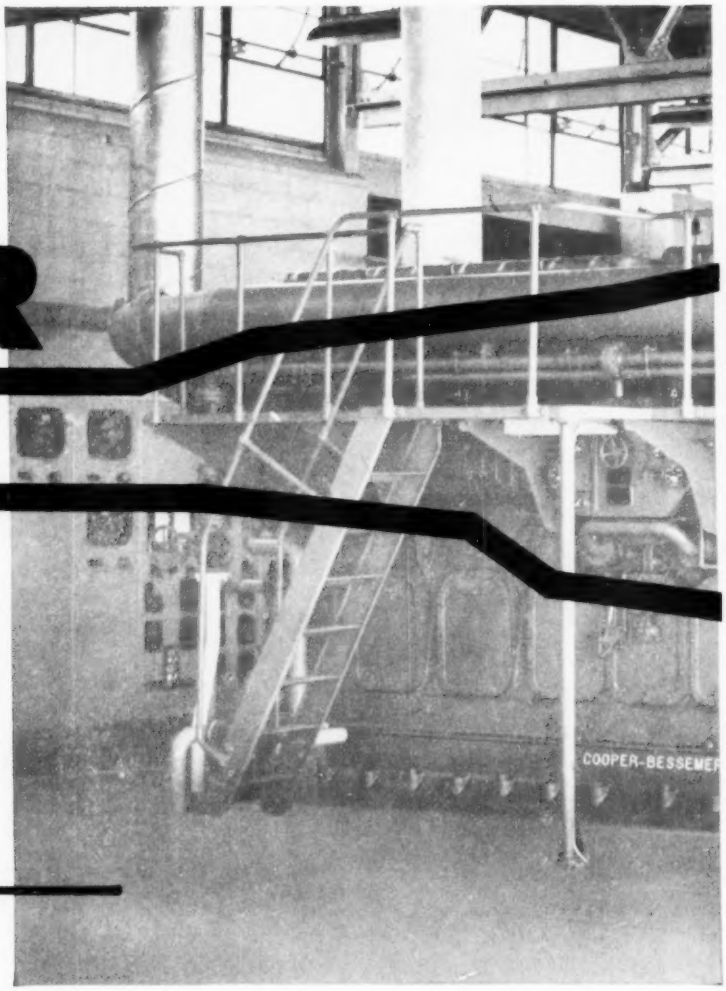


Our 29th Year

JUNE, 1951

BUYERS' GUIDE NUMBER

POWER COSTS



When you lubricate with TEXACO URSA OILS

For maximum power and minimum maintenance costs, lubricate your Diesel, gas or dual-fuel engines with *Texaco Ursa Oils*. These famous oils keep engines clean – free from power-robbing carbon, gum and sludge. *Texaco Ursa Oils* eliminate wasteful blow-by because rings stay free, ports stay open and valves function smoothly . . . assuring better compression and combustion . . . full power

TEXACO

TEXACO

DIESEL POWER and DIESEL TRANSPORTATION for June, 1951, Vol. XXIX, No. 6. It is published monthly by Diesel Publications, Inc., Orange, Conn. Executive and Editorial offices 192 Lexington Ave., New York 16, N. Y. Subscription rates: United States, $3.00 per year, single copies 35¢; Canada $4.00; Foreign $5.00 per year. Entered as second class matter April 29, 1949 at the Post Office, Orange, Connecticut, under Act of March 3, 1879.

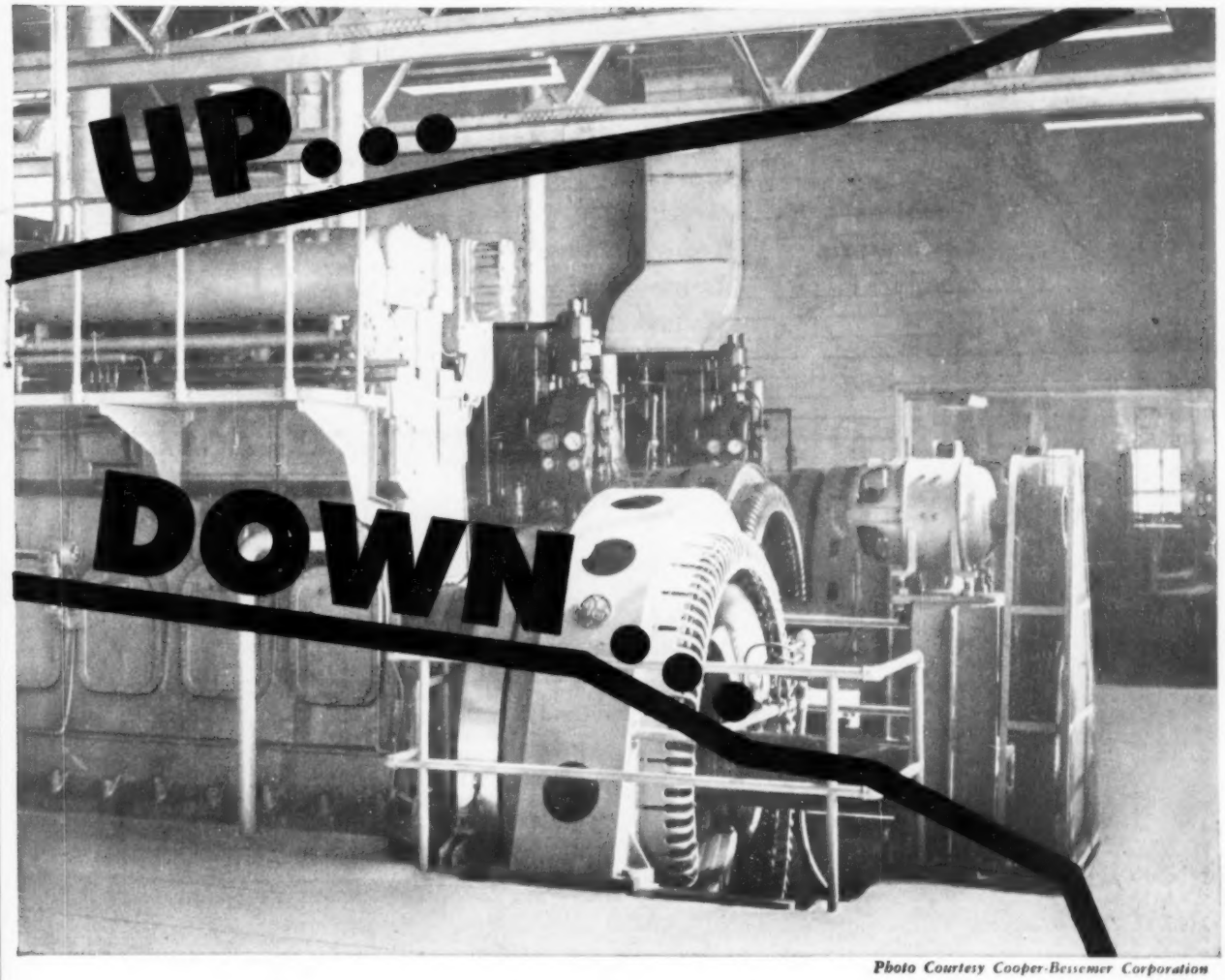


Photo Courtesy Cooper-Bessemer Corporation

. . . less fuel consumption.

Texaco Ursa Oils give bearings and all moving parts full protection . . . assure minimum wear, longer parts life and lower costs for upkeep. For greater efficiency and economy, *Texaco Ursa Oils* are your best bet.

Approved by leading engine builders, Texaco Diesel lubricating oils are available in every needed viscosity. Use them and you'll see why they are America's favorite. For example, in the Diesel field:

More stationary Diesel h.p. and more railroad Diesel locomotives in the U.S. are lubricated with Texaco than with any other brand.

A Texaco Lubrication Engineer will gladly help you increase power and cut costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N.Y.

URSA OILS **FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES**

If you manufacture:

Combines
Compressors
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Cranes
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Farm Machinery
Generators
Hammer Mills
Hoists
Marine Auxiliary Units
Mining Equipment
Pumps
Refrigeration Equipment
Road Rollers

PETTER DIESELS *will cut your costs and give you proved, dependable power!*

MODEL AV2 — 4-cycle, 12 hp, 2-cylinder, 1800 rpm, vertical, water-cooled industrial diesel engine.

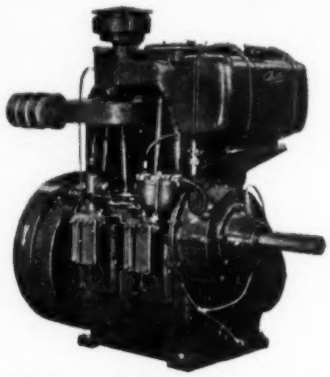
PETTER *WATER-COOLED* DIESEL ENGINES. Available in two basic 4-cycle models. Series AV-3 to 12 hp. Series B-12 to 36 hp. Thermo-syphon tank cooling or radiator. Hand or electric starting without difficulty, even under sub-zero conditions.

Type	HP Cont.	RPM	BORE In.	STROKE In.	LENGTH In.	WIDTH In.	HEIGHT* In.	WEIGHT Lbs.
AV1	3/6	1000-1800	3.15	4.33	29.75	20.375	36.625	406
AV2	6/12	1000-1800	3.15	4.33	36.5	20.625	36.625	598
B2T	12/18	1000-1500	4.33	4.33	33	24	41.375	1198
B3T	18/27	1000-1500	4.33	4.33	39.125	24	41.75	1477
B4T	24/36	1000-1500	4.33	4.33	45.75	24	41.25	1737

*With radiator

PETTER *AIR-COOLED* DIESEL ENGINES. Series AVA—3 to 10.5 hp in one and two-cylinder models. Air-cooled by flywheel fan and ducting over finned cylinders and cylinder heads. Light weight, low overall dimensions. Hand or electric starting. Full-speed drive from either end, or half-speed drive from timing-gear end. Totally enclosed, but easily accessible. Dependable operation under any climatic conditions. Direct injection with an open combustion chamber insures easy starting.

Type	HP Cont.	RPM	BORE In.	STROKE In.	LENGTH In.	WIDTH In.	HEIGHT In.	WEIGHT Lbs.
AVA1	3/5.25	1000-1800	3.15	4.33	29.75	21	30.125	390
AVA2	6/10.5	1000-1800	3.15	4.33	36.5	21	31.75	558



MODEL AVA2—4-cycle, 10.5 hp. 2-cylinder 1800 rpm, vertical, air-cooled industrial diesel engine.

ABOE, Inc.
Empire State Building
350 Fifth Avenue
New York 1, N. Y.

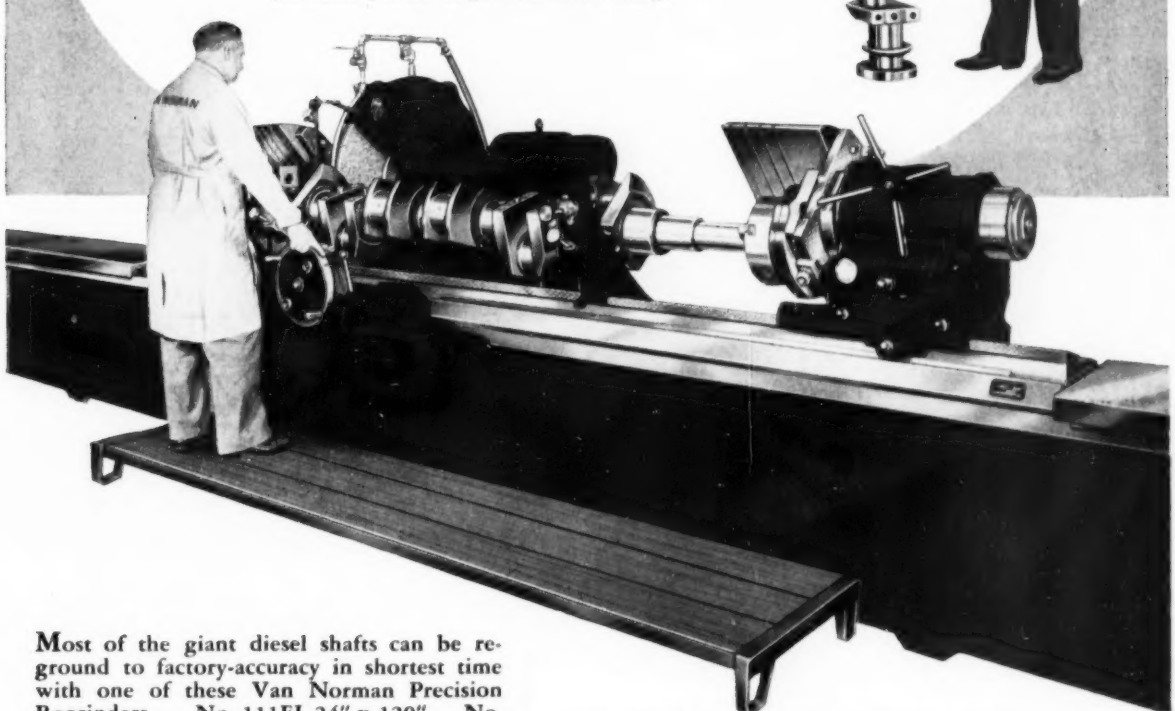
1500 Petter Diesel Engines are produced each week . . . and stocks are held throughout the U.S.A.

Petter parts and service are available in over 100 countries . . . to service your equipment abroad.

Write us today for full facts as to why Petter Diesels will cut your costs and give your equipment proved, dependable power.

There's BIG MONEY in BIG SHAFTS reground on VAN NORMAN NO. 111-EL Machines

(For Shafts up to 130" long . . . 24" and 34" swing)



Most of the giant diesel shafts can be reground to factory-accuracy in shortest time with one of these Van Norman Precision Regrinders . . . No. 111EL-24" x 120" . . . No. 111EL-24" x 130"; No. 111EL-34" x 130". Shaft shown on the No. 111-EL24 above is 103" long with a 10½" stroke, 6"-diameter mains and 5¼" pin journals.

Set-up and operation are quick and easy. And massive Van Norman construction . . . world-known signature of this top-precision machine-tool plant . . . assures the rigidity that means accurately refinished bearing surfaces the *first* time . . . *every* time. *Send coupon today for full details.*

"It Pays to Van Normanize"

VAN NORMAN ALSO BUILDS THESE HEAVY-DUTY MACHINES:

Piston Grinder, 8" diam., 11" long. Boring Bars, 1/9" to 9" diam., 10" to 30" deep. Valve Regrinder, up to 1" stem. Brake Drum Lathes, up to 15" travel. Cylinder Hone, 8" diam., 18" deep. Head Grinders, automatic Pressure Plate & Flywheel Grinder. Pin and Rod Machine.

VAN NORMAN COMPANY
Springfield 7, Mass.

Please send literature and prices on No. 111-EL Regrinders.

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Company _____

Address _____

City _____ Zone ___ State _____

Announcing

4 NEW G-E TRI-CLAD SYNCHRONOUS GENERATORS

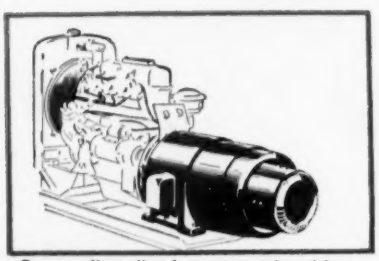
REG. U.S. PAT. OFF.

RATINGS—1.875 TO 50 KVA

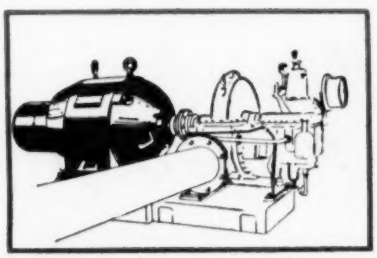
FREQUENCIES—60 AND 400 CYCLES

Four Basic Designs to Choose From—to "custom-fit" the generator to YOUR job

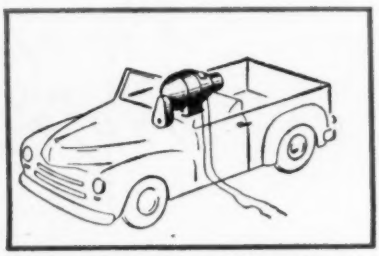
- **Externally regulated 4-pole**
- **Self-regulated 4-pole**
- **Packaged regulated 4-pole**
- **High-frequency 14-pole**



For gasoline, diesel, or gas-engine drive



For steam or hydraulic turbine drive



For portable units, other special equipment

Here's why these new generators are your best power buy—

DEPENDABLE, EFFICIENT—including Tri-Clad's famous "triple protection".

EASY TO INSTALL—space-saving Tri-Clad design makes installation easy.

FLEXIBLE—lightweight construction is well suited to portable installations.

EASY TO MAINTAIN—Tri-Clad lubrication system makes relubrication easy, but seldom needed.

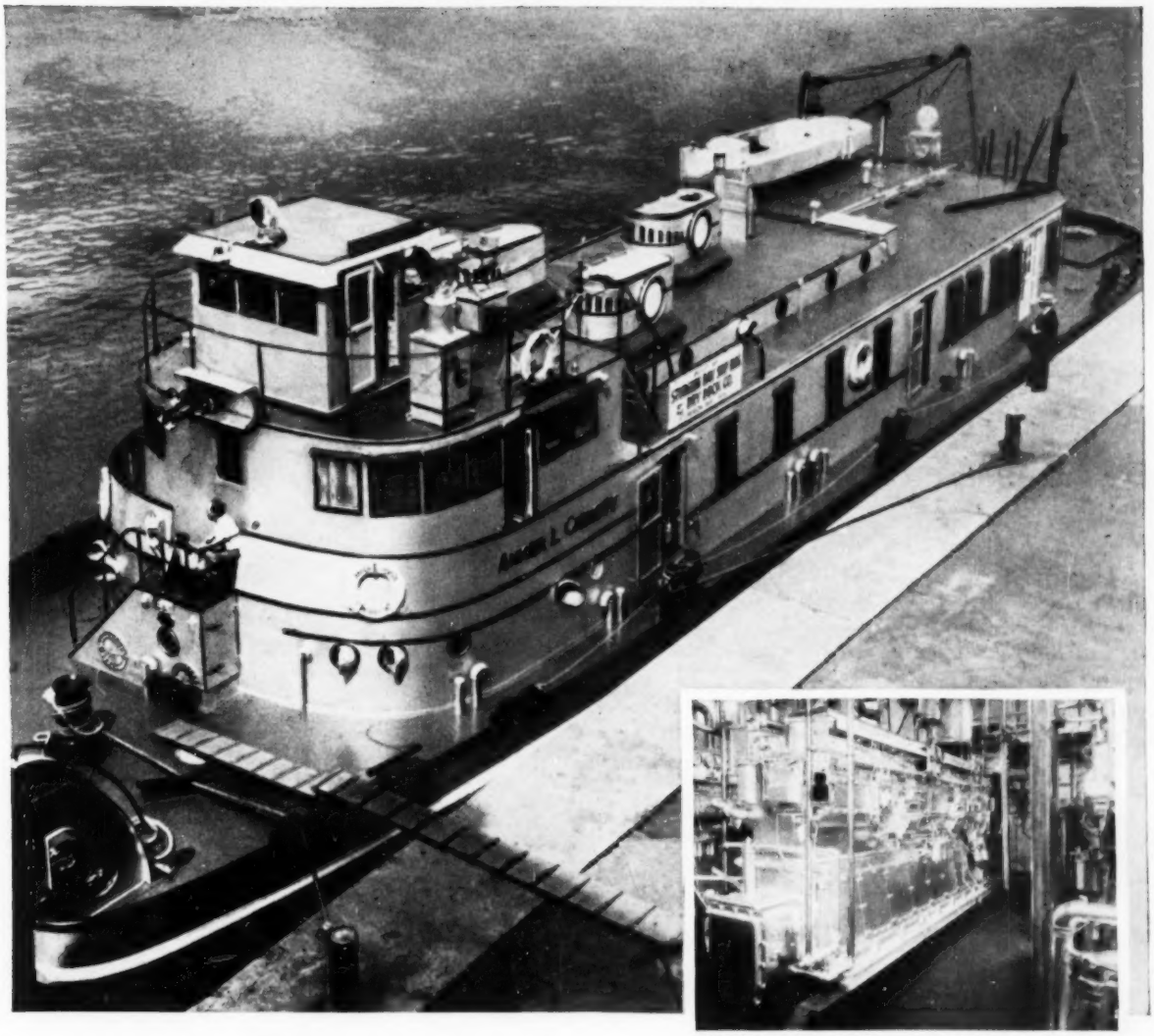
From aircraft ground power to telephone exchanges, these new G-E Tri-Clad synchronous generators fit hundreds of applications. See your G-E sales representative, he'll be glad to discuss your particular application. Or for more information, write for GEA-5470. *Section 765-1, General Electric Co., Schenectady 5, N. Y.*

Here are just a few of the places where these Tri-Clad generators give outstanding service—

- airports
- marine operations
- construction projects
- mining operations
- industrial plants
- mobile applications
- pumping stations
- refineries
- shipyards
- municipal power

GENERAL ELECTRIC

765-1



ENGINE ROOM *of Motor-tow "Anker L. Christy." Built by Sturgeon Bay Shipbuilding and Drydock Company. Powered by triple Cooper-Bessemer diesel engines. Protected by Purolator filters.*

ALL SECURE...

BELOW DECKS, TOO! Fuel lines of triple Cooper-Bessemer diesel engines on motor-tow "Anker L. Christy" are power-protected with D-86 WM Purolator* Filters. This means the complete fuel filtration essential because of close tolerances of injector tip orifices.

PROTECTION like this is becoming common practice with more and more diesel operators. Purolator Filters have revolutionary accordion-pleated design elements which provide up to 10 times the filter area of ordinary units. Lube models trap abrasives as small as microns (.000039"); will neither warp, distort, nor disintegrate.

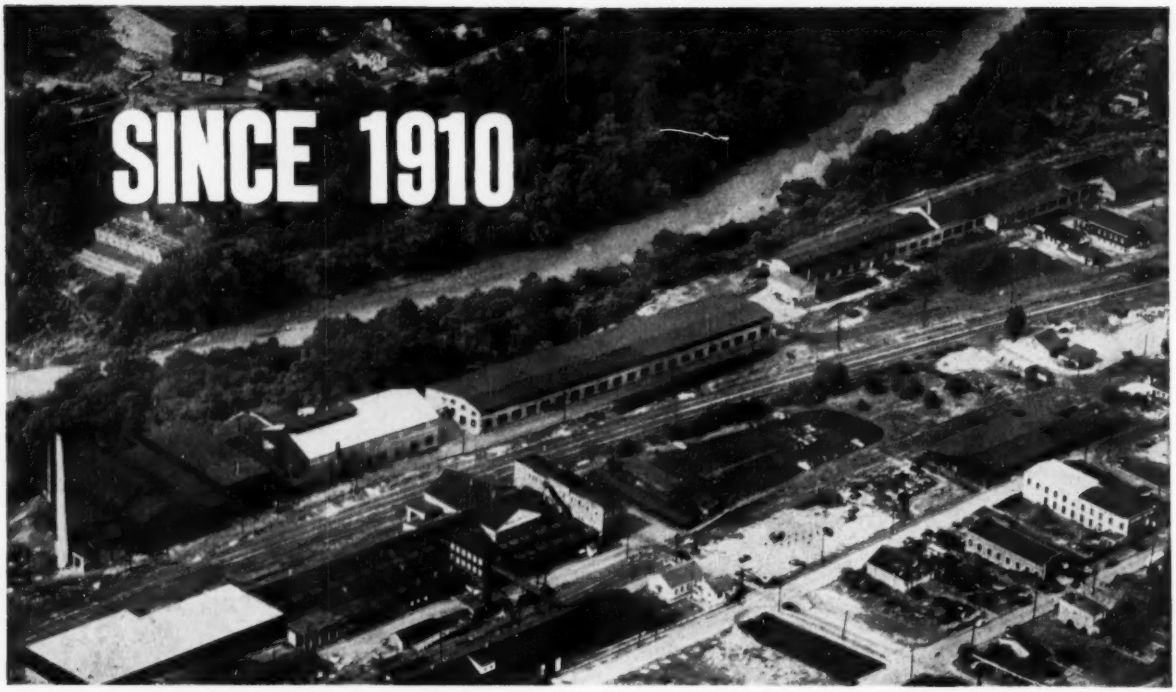
Whatever your filtering problem, let our Engineering Department help you solve it!

*Reg. U. S. Pat. Off.

Protect your Power with...

PUROLATOR PRODUCTS, INC.
Rahway, New Jersey and Toronto, Ontario, Canada
Factory branch offices: Chicago, Detroit, Los Angeles

PUROLATOR
MICRONIC OIL FILTER
"FIRST IN THE FIELD OF FILTERING"



This aerial view of our plant will give you a good idea of our facilities for turning out crankshafts and forgings for diesels.

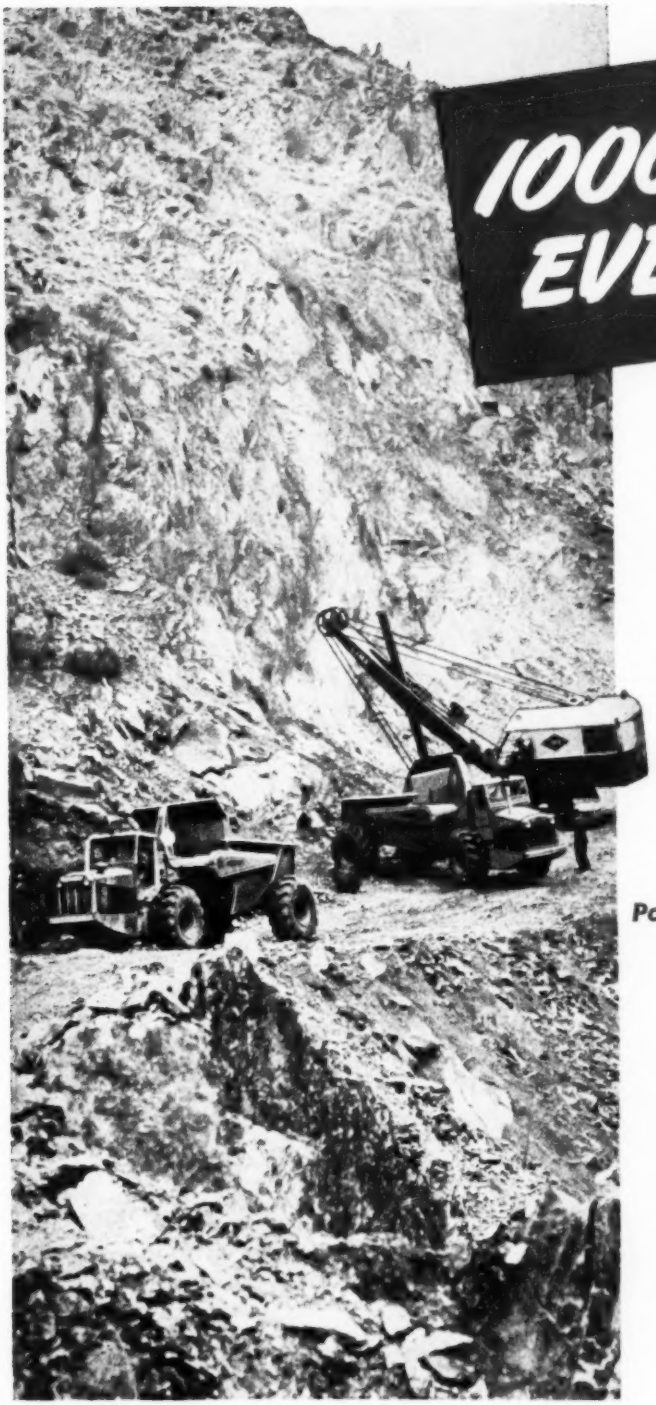
We have been at it since 1910, during which time we have been furnishing a constant and steady supply of crankshafts and forgings for use on diesel engines.

Manufacturers of diesels rely upon Ellwood City Forge for their most exacting requirements. We never disappoint them.

We suggest you write or look in on us for your crankshafts and forgings. We can take care of your needs in a thoroughly satisfactory manner.

Ellwood City Forge Company

ELLWOOD CITY PENNSYLVANIA



1000 YARDS EVERY SHIFT

ON one of the northwest's toughest highway jobs—relocating 4.4 miles of U. S 2 along the steep sidewalls of rocky Pine Canyon, near Wenatchee, Washington—Goodfellow Brothers, Inc., assigned the most difficult hauling to 3 GM Diesel-powered 16-ton Tournarockers.

"They are working out *very* satisfactorily," said James B. Goodfellow. Powered by 186 H.P. 6-cylinder "71" engines, the rear-dump Tournarockers hauled 9 to 11 bank yards each trip. On one 2800-foot, one-way haul, job records show that the three GM Diesel-powered units easily handled shovel production of 1000 yds. every 8-hour shift—helping to keep the job on schedule despite steep grades, rough haul roads and confined hauling conditions at altitudes of 2000 feet.

Power at Every Downstroke

There are good reasons for this performance—rugged design and precision manufacture, two-cycle operation, a smooth flow of plenty of power, quick acceleration and the always-ready-to-go qualities of General Motors Diesels.

These engines are offered as standard or optional equipment in over 500 kinds of power machinery by 120 different manufacturers. They are backed by the experience gained in building more than 315,000 Series 71 units totaling over 48,000,000 horsepower.

For any equipment you buy or re-power, it will pay to specify GM Diesel power.

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES . . . Up to 275 H. P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS . . . Up to 800 H. P.

GENERAL MOTORS

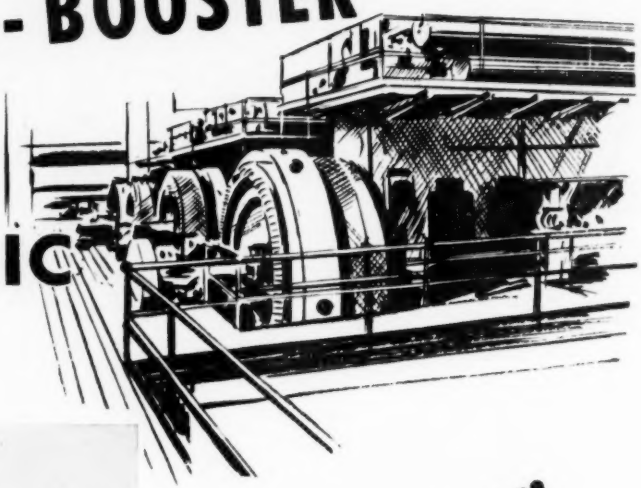
GM GENERAL MOTORS DIESEL POWER

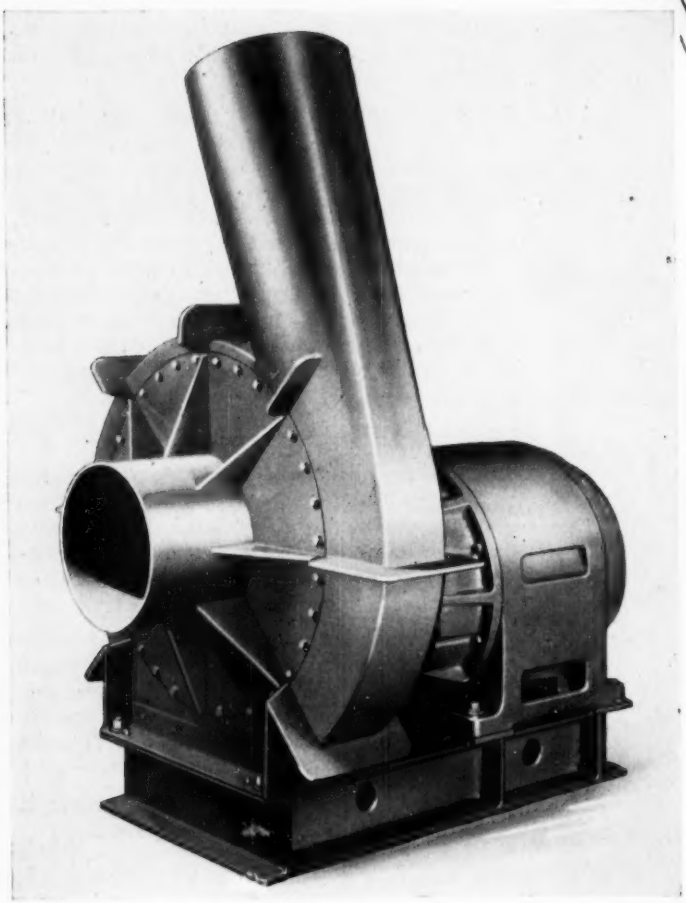
DIESEL BRAWN WITHOUT THE BULK

PERFORMANCE - BOOSTER

FOR

DIESEL-ELECTRIC PLANTS





"Buffalo"

SCAVENGER BLOWER

Efficient Diesel scavenging requires high pressure blowing for long periods of operation, particularly in Diesel-Electric plants.

This "Buffalo" Scavenger Blower operates at 55 inches static pressure. As the photo shows, it is built up to the job — note heavy ribbed casing to withstand high internal pressure, also sturdy base of welded channel. Rotors are all-welded, highly efficient and dynamically balanced.

For better performance through positive, efficient scavenging, specify "Buffalo" Blowers. Write for construction data and sizes.

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

140 MORTIMER ST. BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Branch offices in all Principal Cities

EVAPORATIVE COOLERS AND AXIAL FLOW FANS FOR COOLING MOBILE AND STATIONARY DIESELS

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oils

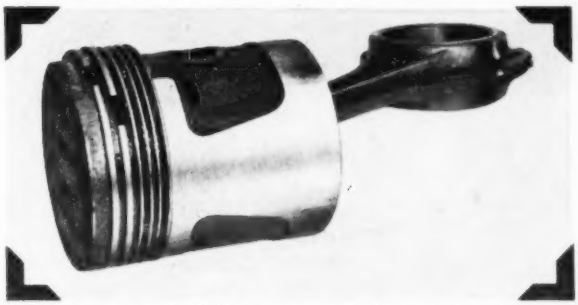
UNIT 1½ ton truck – 6 cyl. Ford-Model F5 engine

CONDITIONS Low engine temperatures – City deliveries

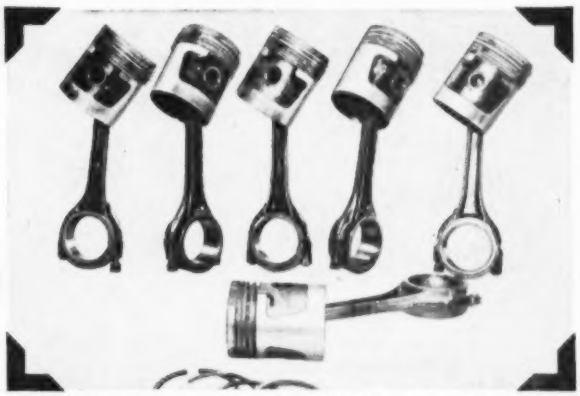
PERIOD 2 years

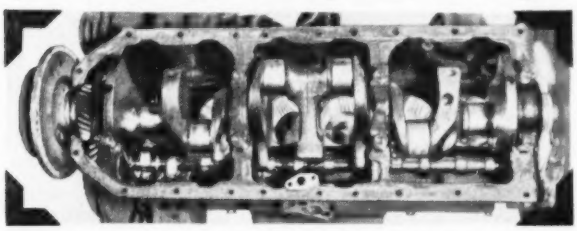
FIRM Pacific Cheese Division of Bordens, San Francisco, Cal.

Only 0.004 inch wear in 68,740 miles stop-and-go driving!



LUBRICATED WITH RPM DELO SPECIAL OIL, these pistons from an engine overhauled for the first time after two years and nearly 70,000 miles of tough delivery-service operation, had no broken or stuck rings. Grooves were clean and all oil-return holes open. All bearings, including mains, were in good condition. Reboring of the cylinders was not necessary because none of the six cylinders was out of round and taper ran only 0.004 to 0.0045 inch.





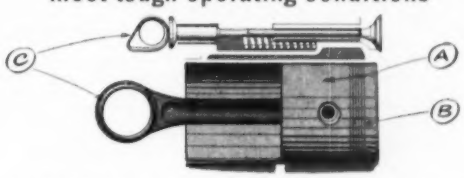
THE ENGINE WAS EXCEPTIONALLY CLEAN as this picture indicates. Cylinder walls were free of lacquer and there were no deposits in valve chambers. Only a thin carbon film was in the bottom of the pan. Valves, pistons, bearings, all parts except rings, were put back in service.

REMARKS: This engine was used in Sacramento under widely varying temperatures. Its stop and go operation seldom allowed engine temperatures to reach normal. There is an RPM DELO Lubricating Oil to meet every heavy-duty engine operating condition.

FREE BOOKLET on the RPM DELO Oils gives you complete information. Write or ask for it today.

RPM DELO LUBRICATING OILS

How RPM DELO Oils meet tough operating conditions



A. Contain special additives that provide metal-adhesion qualities...keep oil on parts whether they are hot or cold, running or idle.

B. Antioxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean, helps prevent scuffing.

C. Special compounds stop corrosion of any bearing metal, and oil foaming in both wet and dry sump engines.

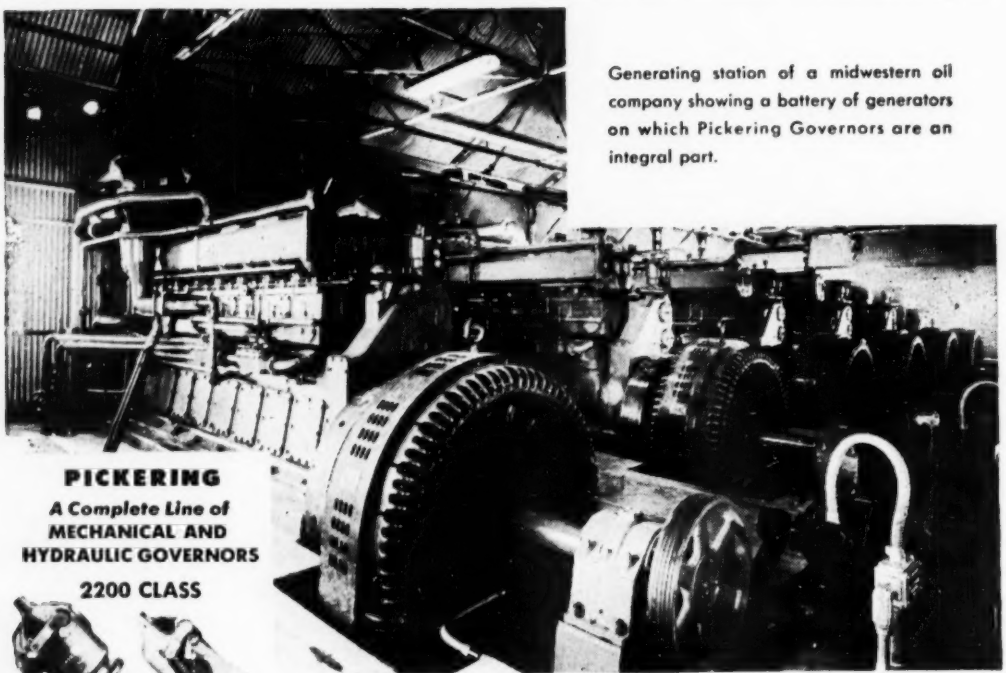
FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco
THE CALIFORNIA OIL COMPANY • Barber, N.J., Chicago, New Orleans
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA COMPANY • Denver, Colorado

PICKERING

Synonym for dependability since 1862



Generating station of a midwestern oil company showing a battery of generators on which Pickering Governors are an integral part.

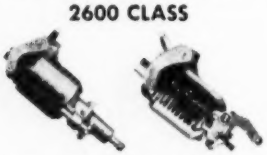
PICKERING

A Complete Line of
MECHANICAL AND HYDRAULIC GOVERNORS

2200 CLASS

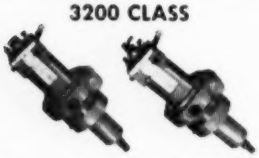
Constant Speed Variable Speed

2600 CLASS



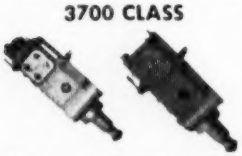
Constant Speed Variable Speed

3200 CLASS



Constant Speed Variable Speed

3700 CLASS



Constant Speed Variable Speed

For 89 years, Pickering Governors have met and anticipated the needs of American Industry. They have more than established a reputation for fully-dependable, long-term service under every type of operating condition.

Today, Pickering stands ready to supply the right governor for the job — to supply the governor that will maintain operating efficiency at its peak regardless of service conditions.

To consult Pickering Engineers may be your passport toward more efficient and economical operation of diesel equipment.

THE PICKERING GOVERNOR CO.

Established 1862

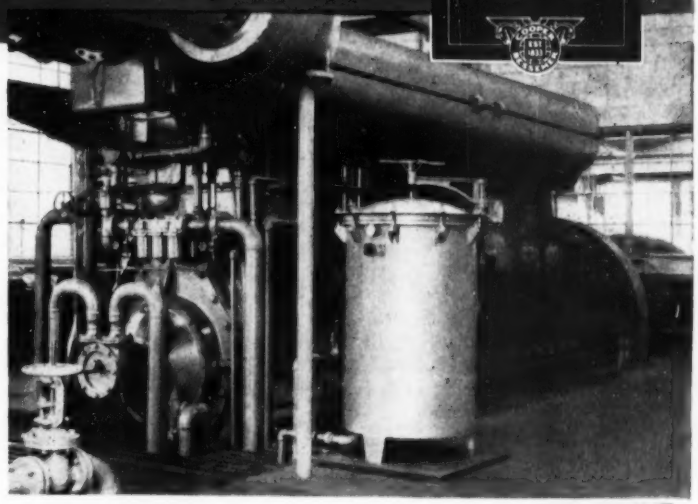
88 LLEWELLYN AVENUE · BLOOMFIELD, NEW JERSEY

7614

MORE POWER TO THE MID-VALLEY LINE

....with 16 additional Cooper-Bessemer supercharged diesels and gas-diesels

Another Example of Efficient Power at Lower Cost



Cooper-Bessemer LS-8 supercharged gas-diesel, 1,715 hp in Mid-Valley Clarkson station. Line will soon have 15 LS-8's, 12 of which are gas-diesel and 3 of which are diesels, plus 9 JS-8 supercharged gas-diesels.

The capacity of the Mid-Valley Line, already one of the nation's largest oil line systems, will soon be expanded by the addition of 26,465 Cooper-Bessemer diesel and gas-diesel horsepower.

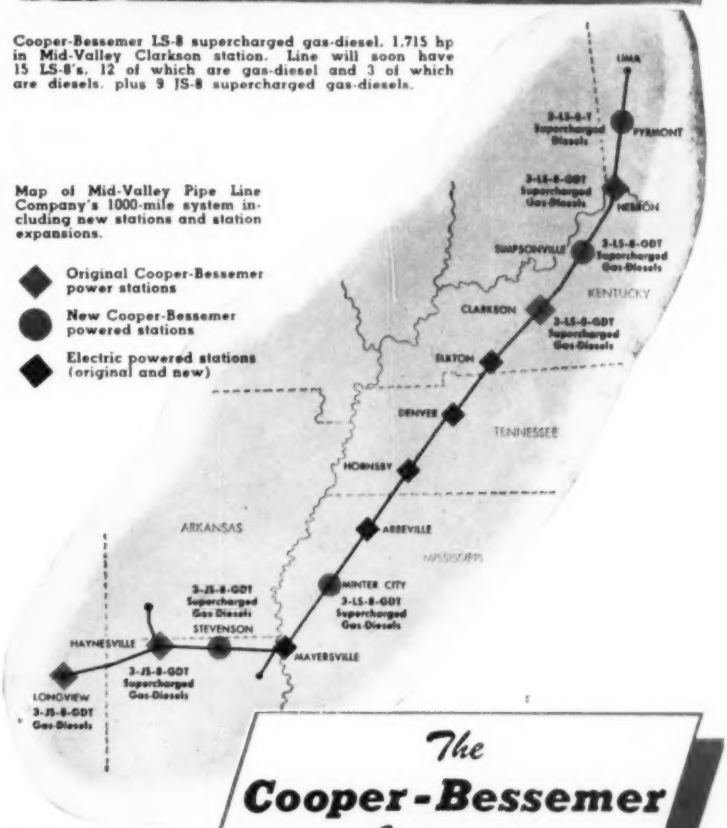
From the very beginning, the planning that went into the Mid-Valley Line took advantage of the latest developments in power and pipeline engineering to gain optimum operating economy. And, since Mid-Valley has had experience with their original Cooper-Bessemer Gas-Diesels, there's plenty of proof that these modern, smooth-running engines have what it takes, while considerably bettering their attractive guarantees.

The Mid-Valley Line's latest Cooper-Bessemers will power four new booster stations, and will increase the power in each of the four original engine-driven stations. This calls for five JS-8 supercharged Gas Diesels, eight LS-8 supercharged Gas-Diesels and three LS-8 supercharged diesels. In addition, the four JS-8 atmospheric engines originally installed in the Longview and Haynesville stations are being converted to supercharged gas-diesel operation. Thus all engines, both new and old, will be supercharged for peak economy, peak output throughout the system.

Like Mid-Valley, you too stand to gain plenty with dependable, highly efficient Cooper-Bessemers. You just can't do better!

Map of Mid-Valley Pipe Line Company's 1000-mile system including new stations and station expansions.

- Original Cooper-Bessemer power stations
- New Cooper-Bessemer powered stations
- Electric powered stations (original and new)



The Cooper-Bessemer Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York, N. Y. Washington, D. C. Bradford, Penna. Parkersburg, W. Va.
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St. Louis, Mo. Los Angeles, Calif. Chicago, Illinois Caracas, Venezuela

for Quiet Compressor and Engine Operation in Your Plant and Community

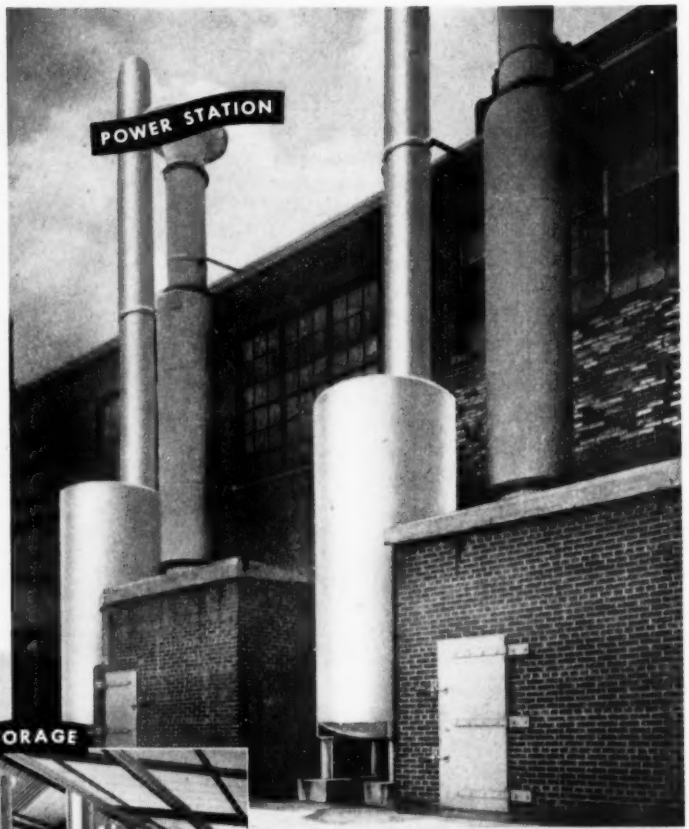
Install Burgess-Manning Snubbers

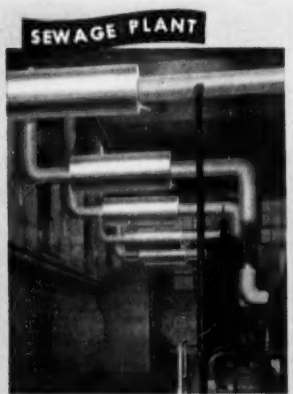
• You can help build good will in your plant and community by quieting the annoying roar of engine exhausts and the throbbing pulsations of compressor intakes by installing Burgess-Manning Snubbers on the engines and compressors in your plant. These Snubbers, perfected by almost a quarter century's intensive research and broad practical field experience, reduce noise effectively by converting high energy "slugs" of exhaust gases and incoming pulses of intake air to a smooth continuous flow.

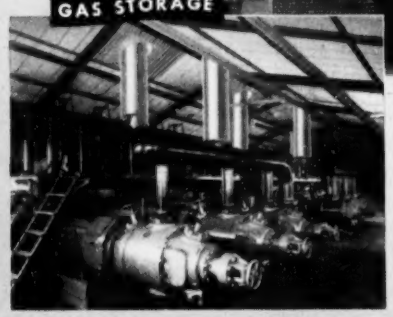
Sound engineering recommendations; a quality product, rugged in construction, reliable in operation; guaranteed performance . . . are available to you when you consult Burgess-Manning engineers.

BURGESS-MANNING COMPANY

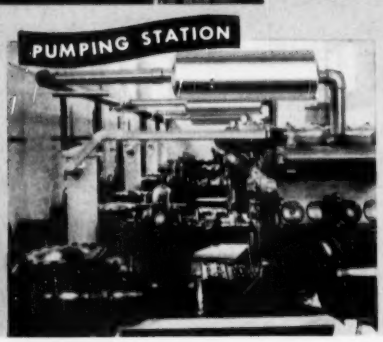
LIBERTYVILLE • ILLINOIS

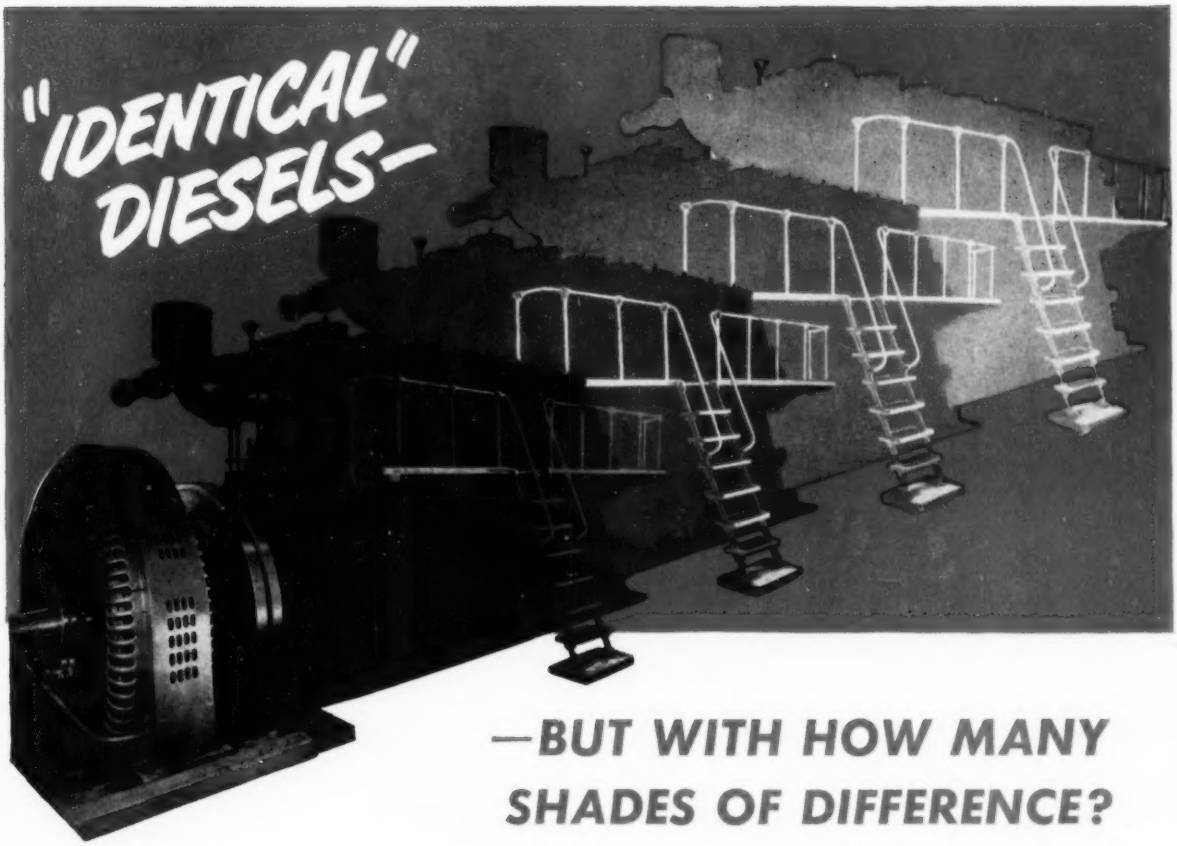






Write for Bulletin No. 497





—BUT WITH HOW MANY SHADES OF DIFFERENCE?

When they're delivered to the buyers a number of Diesels may be identical in make and model. But in actual use . . . working in different plants and climates . . . differently loaded, operated and serviced . . . the "identical" Diesels soon differ even more than just a shade. That's one reason the lubrication which seems ideal in one particular case may cause a similar Diesel working elsewhere to run up unnecessary downtime.

You can guard against the adverse effects of such variables . . . against the improper lubrication of your costly Diesels . . . by calling in a Cities Service Diesel Lubrication specialist. He knows all types of Diesels and their lubrication; he knows practical plant procedure, too. That's why the Diesel lubrication schedule he will be glad to develop especially for you can provide far better protection for your Diesels—and for your profit showing. Contact the Cities Service office nearest you, or mail the coupon now for booklet on "Diesel Engine Lubrication."

The Cities Service complete line of top quality petroleum products includes a Diesel lubricant for every operating condition.

CITIES SERVICE OIL COMPANY
Sixty Wall Tower, Room 910
New York 5, N. Y.

Please send me without obligation your booklet on Diesel Engine Lubrication.

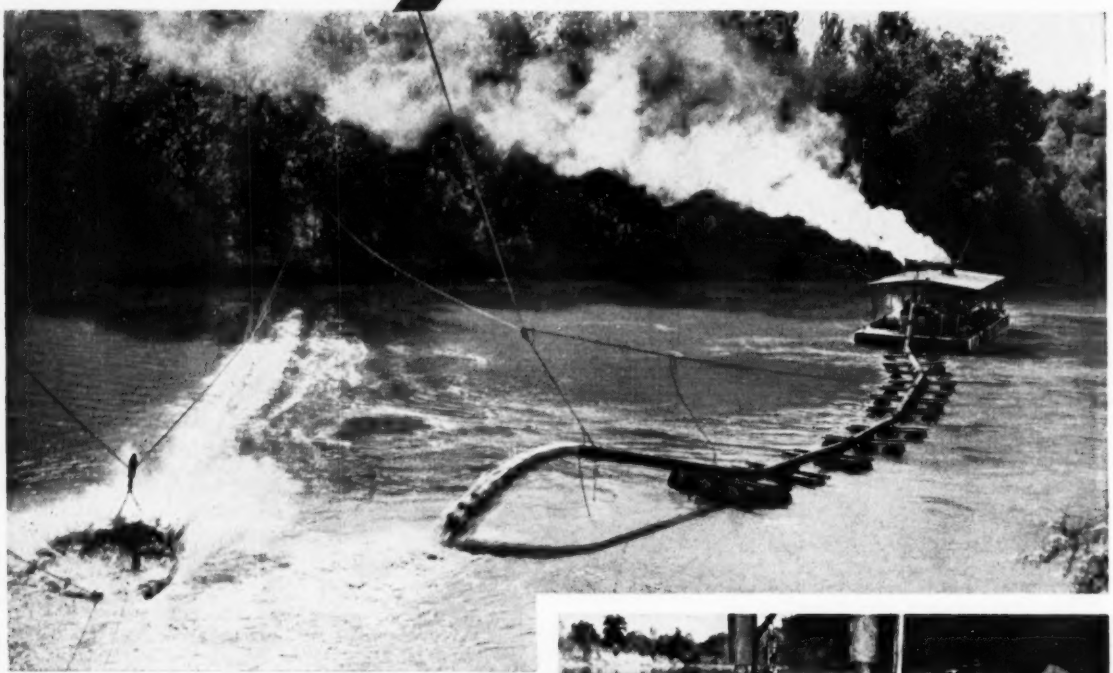
Name_____

Company_____

Address_____

City_____ State_____

All Day Sucker

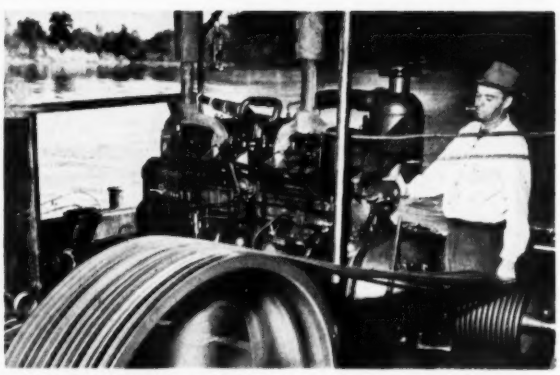


ROADS FROM RIVER BOTTOM! UD-24 Diesel power pumps sand and gravel to be used for highway improvement in Arkansas and Missouri.

Big International UD-24 sucks 1,400 cubic yards of sand and gravel every day from Black Rock river

Hour after hour this International Diesel forces a high-pressure stream of sand and gravel through a 200-foot pipe to the river bank. "The UD-24 does the job fine and has enough surplus power to run all the extra barge equipment," says owner R. C. Tate, Black Rock, Arkansas. "And the engineers like its quick starts and easy maintenance."

Steady performance and big working capacity of International engines make them favorites where low-cost, non-stop power is needed.



POWER FOR PUMPING PROFIT is furnished by this UD-24 Diesel. Owner R. C. Tate is mighty pleased with this unit.

Get the whole story on these profit-making power plants from your International Industrial Distributor or Power Unit Dealer. Take a look at his stock of approved parts and efficient service facilities. You'll find out why Internationals give you dependable, profitable power for years to come.

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

INTERNATIONAL INTERNATIONAL HARVESTER **POWER THAT PAYS**

THIS ANSWERS YOUR 7 REQUIREMENTS

for a better filter ...for Diesel fuel and lube

1. You require FINE filtration. Cuno MICRO-KLEAN is made in several densities giving from 10 to 50 micron filtration. It is guaranteed to remove 100% of injurious solids down to rated size plus a large percentage down to 1 micron.

2. You require DEPENDABLE filtration. Cuno MICRO-KLEAN cartridge is impervious to crankcase acids, moisture, other damaging agents. Won't soften or harden, swell or shrink, rupture or channel to release contaminants or clog injectors or damage pump. (Can be installed on suction side.)

3. You require greater CAPACITY. Maximum porosity (85-90%) of fibre-felted cartridge and exclusive "graded density in depth" produce *double* the usual dirt-holding and flow capacity.

4. You require COMPACTNESS. Greater capacity and absence of structural components cut down space needed. Full flow filtration of lube is now practical.

5. You require maximum STRENGTH. Resinous impregnation and polymerization eliminates need for screens, cores, liners, socks or other extraneous material . . . withstands more than 70 psi differential pressure.

6. You require LOW pressure drop. Openness of structure and absence of structural components reduce normal resistance to flow.

7. You must not remove ADDITIVES. Filtration is accomplished by mechanical principles—no adsorptive or absorptive properties.

Full information in MICRO-KLEAN bulletin. Send coupon.

Want full flow fluid cleaning with a continuously-cleanable strainer?

Cuno AUTO-KLEAN (all metal disc-type) is available for straining from .0035 to .062 in.

SEND COUPON FOR LATEST NEWS ON FILTRATION OF DIESEL FUEL AND LUBE

CUNO

Complete Line Fluid Conditioning

Removes More Sizes of Solids from More Types of Fluids

MICRONIC (Micro-Klean) • DISC-TYPE (Auto-Klean)
WIRE-WOUND (Flo-Klean)

Cuno Engineering Corporation
2511 South Vine Street, Meriden, Conn.

Please send me more facts on Cuno MICRO-KLEAN for Diesel services.....also AUTO-KLEAN.....

Name.....Title.....

Company.....

Address.....

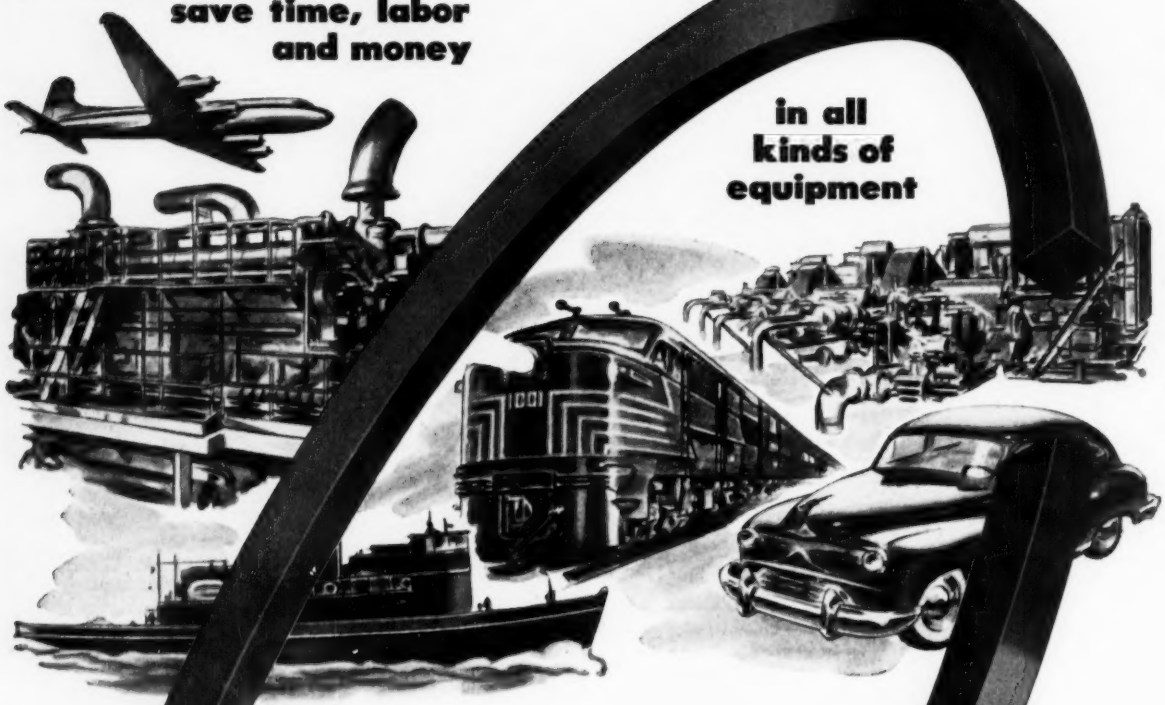
City.....State.....

PLEASE ATTACH COUPON TO YOUR BUSINESS LETTERHEAD

10.1.11

KOPPERS piston rings save time, labor and money

in all kinds of equipment



Railroads, trucks, buses, airplanes, cars, pumps . . . in every conceivable use of piston rings . . . Koppers provides *better* oil control, *more* power, *less* wear, *longer* life for expensive equipment!

Koppers K-Spun Piston Rings, produced by centrifugal casting process, are *100% stronger . . . four times more resistant to combustion shock than ordinary rings! They will not break in installation or for the life of the engine.*

Koppers Porous Chrome* Rings have a porous chrome surface that holds and distributes oil during break-in, quickly wears down to perfectly seated solid chrome that prevents grit and other particles from embedding in the ring surface where they can scratch cylinder walls. Porous Chrome Rings last up to four times as long as other rings, reduce cylinder wear 50% or more. That's why hundreds of companies are reporting amazing savings in equipment and maintenance costs through the use of Koppers Rings. Remember . . . we make rings for any equipment that uses piston rings.

*VAN DER HORST PROCESS

If you have a piston ring problem, why not get the *right* answer from us? Write, wire or phone Koppers Co., Inc., Piston Ring Dept., 1546 Hamburg St., Baltimore 3, Md.

KOPPERS

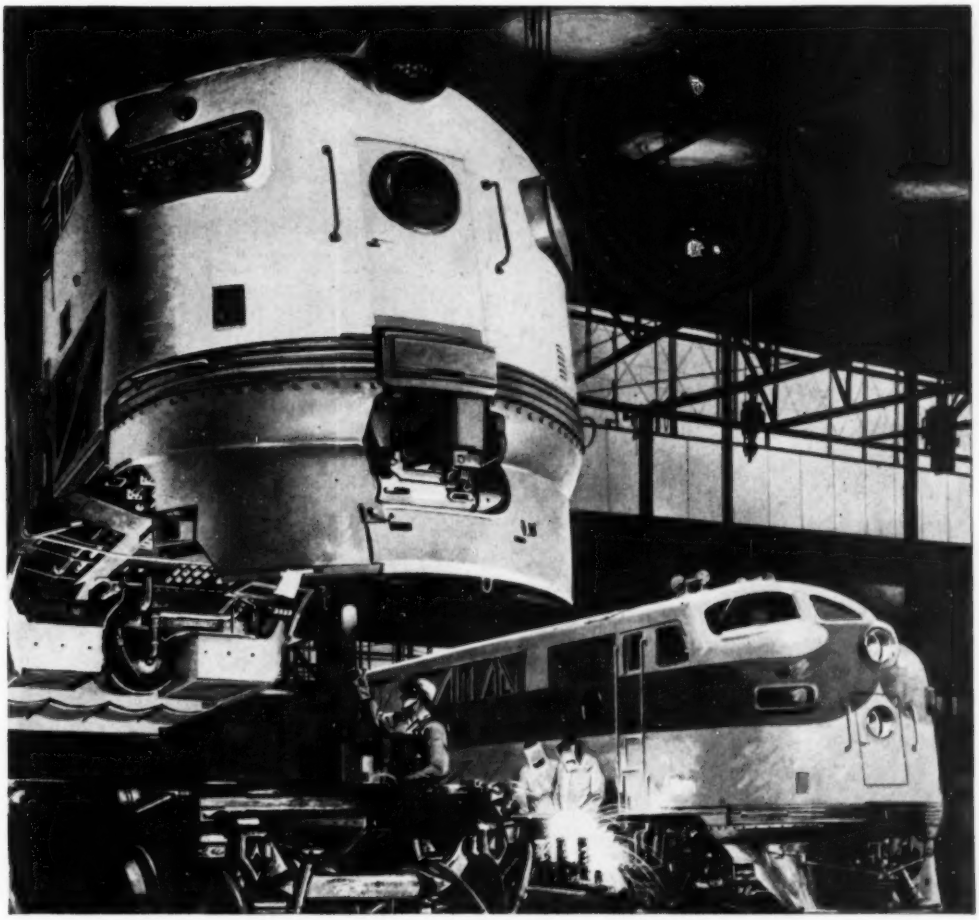
KOPPERS

AMERICAN HAMMERED

PISTON RINGS

SPECIFY: Fast's Couplings . . . Koppers Piston Rings . . . both famous products of the Koppers Co., Inc.

ONLY KOPPERS CAN FURNISH K-SPUN OR POROUS CHROME!



ARSENAL of HORSEPOWER!

To meet America's growing transportation needs —especially in the hour of national emergency —Electro-Motive Division shops are now building General Motors Diesel locomotives as rapidly as facilities and supplies permit. Their combined output is the largest production of new railroad horsepower in the world today, and a major contribution to our nation's strength, for many reasons.

Today General Motors Diesels are the work horses of the railroads. They are hauling 33% of the total freight ton-miles and 40% of the total passenger car-miles reported by all roads, *yet they number only 15 per cent of America's locomotive fleet!* And with General Motors Diesel power, trains maintain faster schedules, speeding up the re-use of cars.

It is power that can be depended upon when the chips are down. In 16 years' service on the rails no General Motors Diesel has ever worn out—thanks to Electro-Motive's unique parts and component rebuilding service. Parts depots and factory branches located at central points give railroads quick service in keeping their General Motors Diesels "on the line."

Because General Motors locomotives do more work they pay for themselves faster and contribute savings for the purchase of other new equipment needed by the railroads for better service. That is why the demand for these modern Diesels is so urgent today—for long experience proves that better trains follow General Motors locomotives.

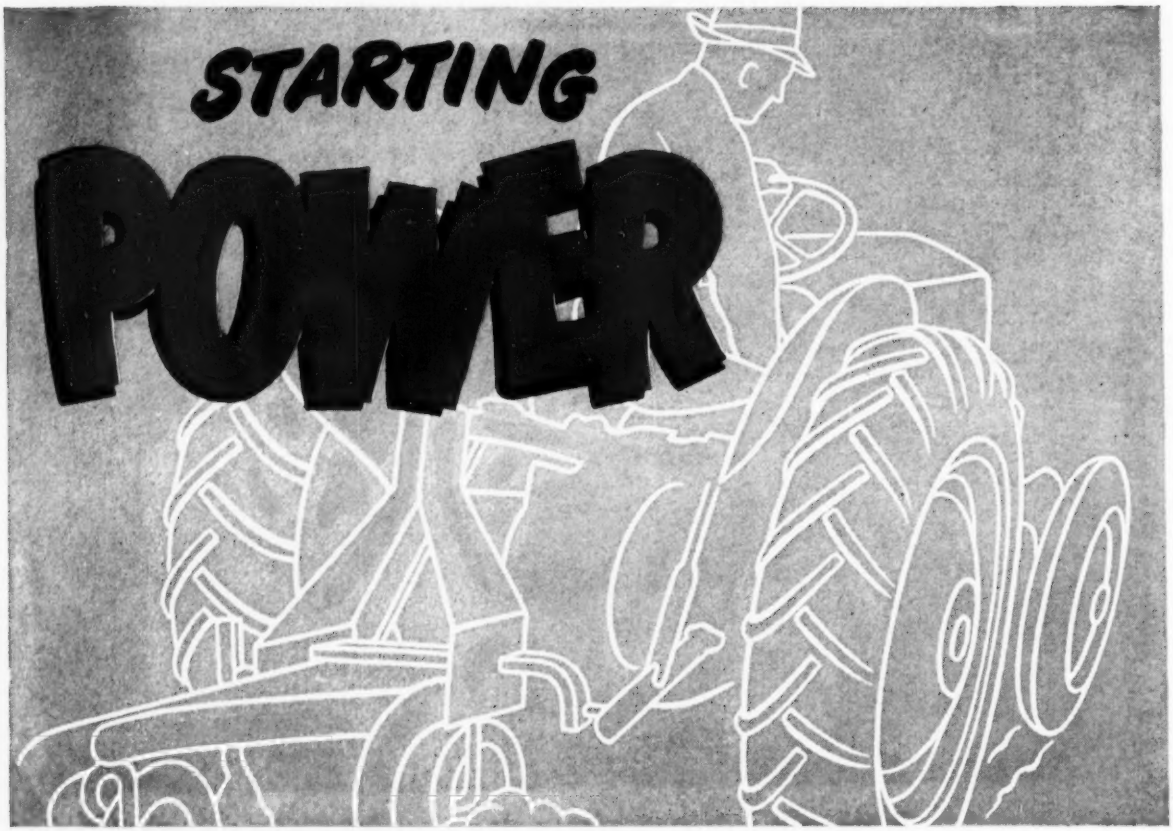
GM
GENERAL MOTORS
LOCOMOTIVES

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS • LA GRANGE, ILLINOIS

Home of the Diesel Locomotive

In Canada: GENERAL MOTORS DIESEL, LTD.; LONDON; ONT.



Powered to "give it" built to "take it"

Exide DIESEL STARTING BATTERIES

Start your Diesel engines with Exide . . . the battery that's built specifically for the job. It's a product of long development and endless testing to give you top-cranking performance under the most severe operating conditions. With Exide Batteries you get:

Quick breakaway and *high cranking speeds.*

RUGGED CONSTRUCTION for hard service.

EXTRA LONG LIFE—low depreciation, less frequent replacements.

LOW COST maintenance.

Use Exide Diesel Starting Batteries for all heavy-duty service . . . in buses, trucks, tractors, off-the-highway equipment, ships, power plants, Diesel-electric locomotives.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto
"Exide" *Reg. Trade-mark U. S. Pat. Off.*

WHEN IT'S AN Exide
YOUR DIESELS START

1888 . . . DEPENDABLE BATTERIES FOR 63 YEARS . . . 1951

Alnor Protection

EXTENDS THE LIFE LINE OF YOUR DIESEL

To assure continued high efficiency, every diesel should have the best protection against maladjustment and wear. Alnor Exhaust Pyrometers provide this protection by giving an instant check on all cylinders, anticipating trouble from preignition, detonation, overloading, or breakdown of lubrication, etc. Modern design and rugged construction assure accurate, reliable instrument service on any installation, large or small, even under severe operating conditions.

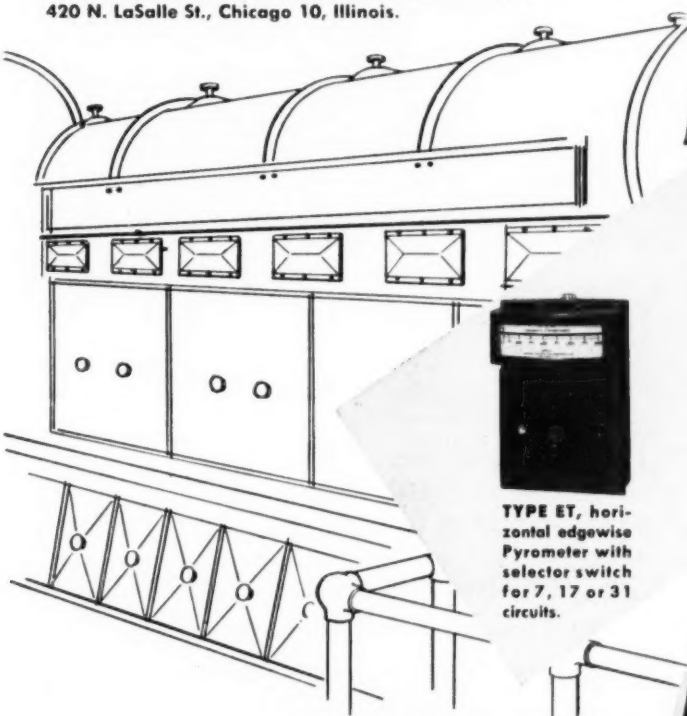
Such constant protection reduces maintenance time and expense to a minimum—increases efficiency and operating economy. Alnor Pyrometers are low cost, easy to install on old or new engines. Ask your Alnor Representative to assist you in selecting the right equipment from the full line of Alnor Exhaust Pyrometers and special thermocouples. Illinois Testing Laboratories, Inc., Room 507, 420 N. LaSalle St., Chicago 10, Illinois.

TYPE RT, switchboard type flush or surface mounting with switch for 8, 17 or 31 circuits.

TYPE BZ, for switchboard, wall or bracket mounting, with switch for 8 or 17 circuits.

TYPE FAX, for switchboard or flush mounting, with switch for two to 16 circuits.

TYPE ET, horizontal edgewise Pyrometer with selector switch for 7, 17 or 31 circuits.



Send for Bulletin 4361, describing the complete Pyrometer line. Use this handy coupon.

Illinois Testing Laboratories, Inc.
Rm. 507, 420 N. LaSalle St.,
Chicago 10, Illinois

Please send me a copy of Bulletin 4361.

Name.....

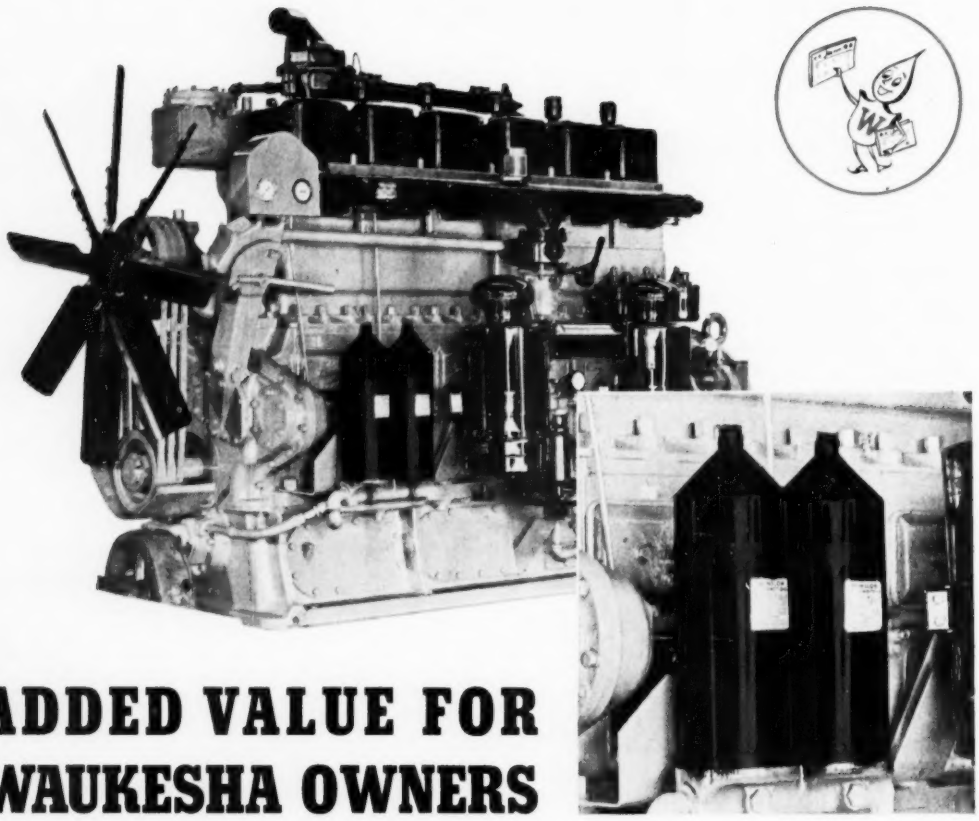
Company.....

Address.....

City.....Zone.....State.....

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY



ADDED VALUE FOR WAUKESHA OWNERS

WINSLOW Full-Flow Filters Approved for Many Engines

Here is a Winslow Lubricating Oil Conditioner, Model 1664-B-51, as installed on a Model 6-LRO Waukesha heavy duty gas engine built for oil field drilling, cotton ginning, irrigation pumping and other uses.

Waukesha Motor Company, whose name has been synonymous with quality and dependability on heavy duty diesel, gasoline and natural gas engines for almost half a century, has approved the installation of full-flow Winslow Filters as standard equipment on many of its engine models. To the owners of these engines, this is an important added value. With these positive in-line full-flow filters giving 100% protection to bearings and other moving parts, the added value takes many forms — longer engine life, freedom from break-downs and repairs, and sharply reduced costs in both money and man-hours. Whether *your* engine is large or small, old or new, give it the added value of Winslow Filters!

A COPY OF OUR FREE BOOKLET, *"THE CASE OF THE DIRTY DRIP,"* IS YOURS ON REQUEST

WINSLOW FILTERS

513-WCP-1

Winslow Engineering Company • 4069 Hollis Street • Oakland 8, California

P&H DIESEL ENGINES

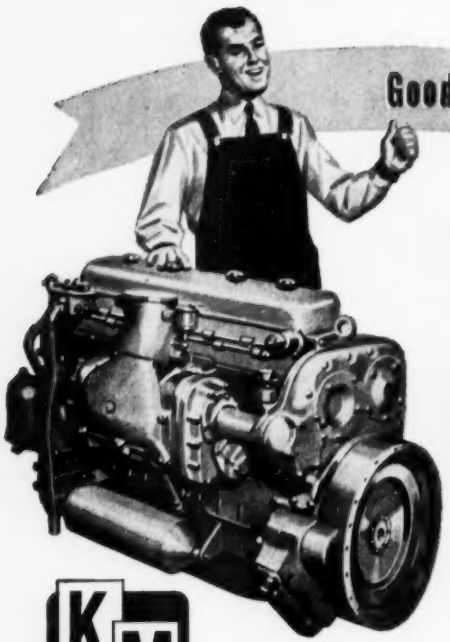
2-CYCLE

MINUTES...NOT HOURS!

REPLACE THIS COMPLETE CYLINDER ASSEMBLY

Here's something you can't do with any other diesel. The P&H cylinder assembly (comprising head, liner, piston and rod) fits *any* P&H Model — 1, 2, 3, 4 or 6-cyl. It's built as a unit; stocked as a unit; installed as a unit — anywhere — in minutes . . . not hours or days! Think what this can mean to you in time and money saved. No wonder more and more diesel users are standardizing on P&H Diesels. For literature, write Diesel Division, Harnischfeger Corporation, Port Washington, Wisconsin.

P&H DIESEL DIVISION
HARNISCHFEGER CORPORATION
PORT WASHINGTON WISCONSIN, U. S. A.



Good news for owners of G M DIESEL ENGINES!

You can save time, eliminate parts damage by maintaining your equipment with

KENT-MOORE

SPECIAL SERVICE TOOLS

Ease and speed of maintenance have always been important "plus factors" in favor of G.M. Diesel Engines. Take the basic simplicity of their famous 2-cycle design, for example. Note the interchangeability of their low-cost, standardized parts. Then, too, consider the amazing added efficiency with which recommended maintenance operations can be performed... thanks to Kent-Moore Special-Purpose Service Tools.

Yes, once you've used them, you'll agree there's something *extra special* about these Kent-Moore Tools. For you see, they're "service engineered"... developed expressly to meet the essential maintenance requirements of *your* G.M. Diesel Engines. Each tool is designed to perform a specific service or repair operation for which no adequate standard tools exist. And each one is built to accomplish its particular job quickly, easily, accurately . . . without danger of damaging parts, and at lower cost than is possible by means of improvised makeshift methods.

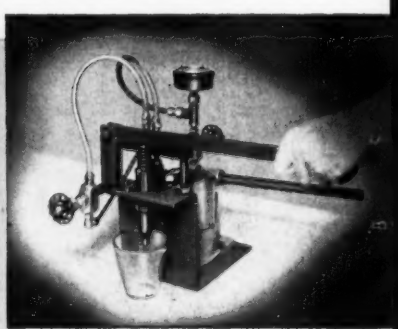
So, whether you maintain your own engines . . . or whether you have them serviced by your G.M. Diesel distributor, you'll do well to insist upon the use of genuine Kent-Moore Special Service Tools.

You know the job's done right with Kent-Moore Special Service Tools!

J 1917-A—Tachometer Drive Puller

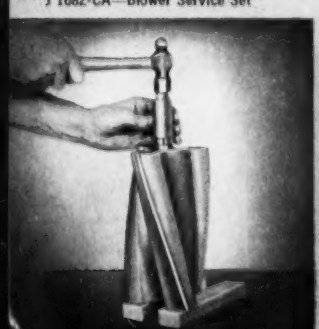
J 3272—Piston Installing Tool

J 1241-A—Injector Service Kit



J 2620—Injector Testing Fixture

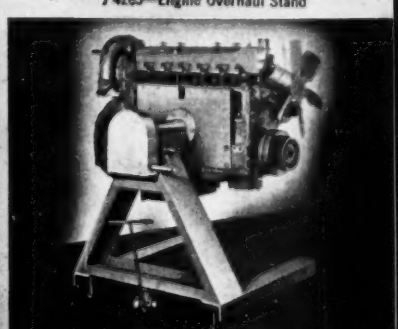
J 1682-CA—Blower Service Set

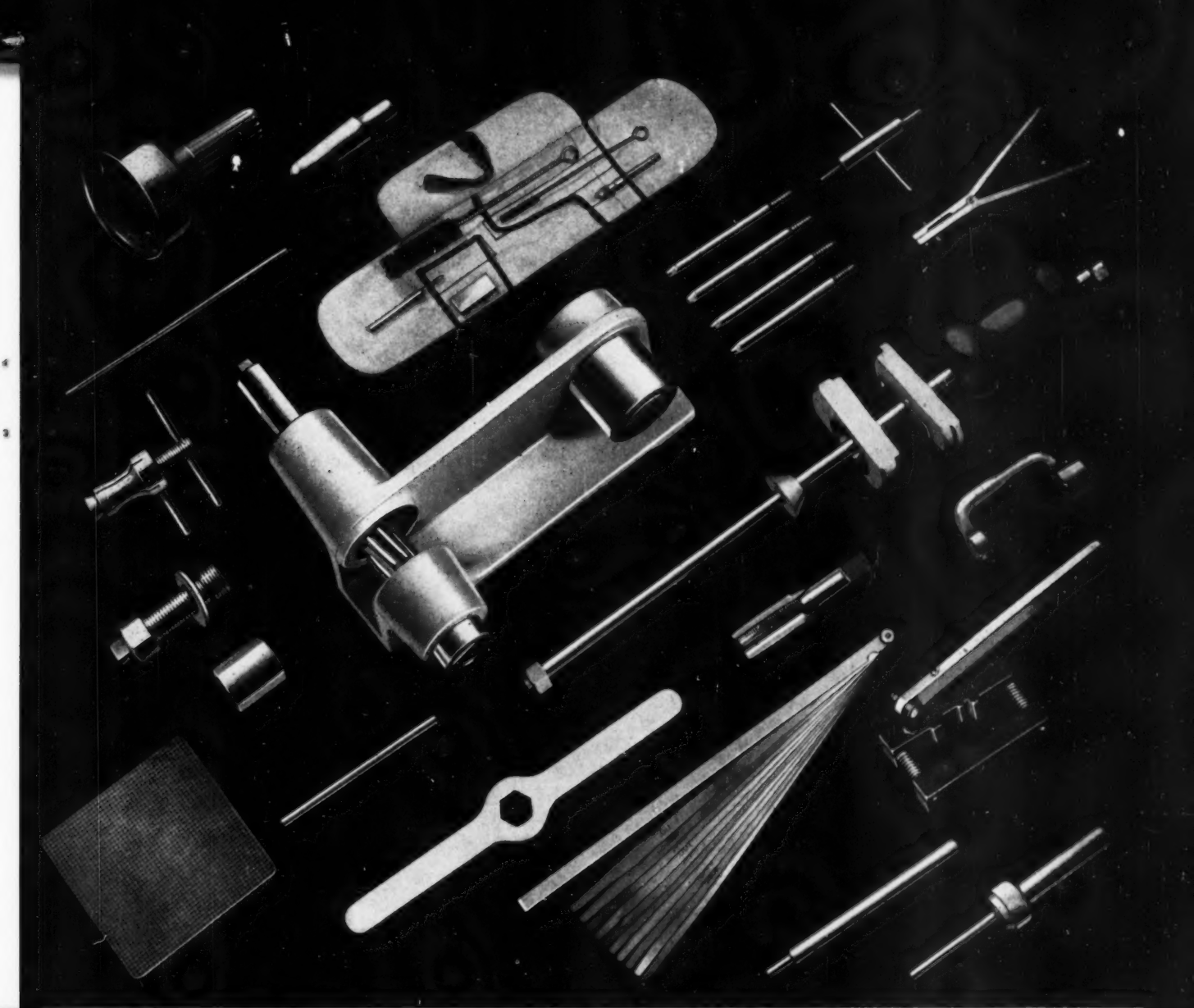


J 2202-A—Injector Copper Tube Installer

J 1227-A—Valve Spring Compressor

J 4265—Engine Overhaul Stand





SPECIAL TOOL REQUIREMENTS FOR BASIC REPAIR SERVICE ON GM DIESEL ENGINES

ENGINE OVERHAUL

TOOL NO.	DESCRIPTION	PRICE
J 1359	Crankshaft Oil Seal Expander	11.95
J 1686	Connecting Rod Bushing Reamer Set	79.50
J 1902-A	Camshaft Gear Puller	13.50
J 1927-A	Flywheel Housing Aligning Studs (4)	3.70
J 1928	Cylinder Head Stud Nut Wrench	5.20
KMO 232	Piston Ring Remover and Replacer	1.50
J 1903	Camshaft and Oil Pump Gear Replacer	4.95
J 1904-A	Flywheel Loosening Jack Screws	2.50
J 1909	Cylinder Liner Clamps (Set of 3)	4.75
J 1918	Cylinder Liner Remover	19.95
J 3272	Piston Installing Tool	11.95
J 3174-A	Feeler Gauge Set (For piston fitting)	2.75
J 1917-A	Tachometer Drive Puller	11.50

ENGINE TUNE-UP

TOOL NO.	DESCRIPTION	PRICE
J 1242	Injector Timing Gauge (Std. Output 1.484")	.95
J 1853	Injector Timing Gauge (High Output 1.460")	.95
J 1319-A	Cylinder Compression Gauge	38.50
J 1652-A	Governor Spring Retainer Nut Wrench	2.25
KMO 233	Valve Lash Feeler Gauge (.008"-.010")	.45
KMO 233-B	Valve Lash Feeler Gauge (.011" and .013")	.45
KMO 320	Fuel Pressure Gauge	4.95

CYLINDER HEAD OVERHAUL

TOOL NO.	DESCRIPTION	PRICE
J 2202-A	Injector Copper Tube Installer Set	15.95
J 267	Valve Guide Remover 11/32" Guide	1.85
J 4144	Valve Guide Replacer	2.90
J 3091	Valve Seat Insert Remover	15.95
J 1736	Valve Seat Insert Replacer	4.85
J 3087	Cylinder Head Holding Plates (Pair)	18.65

TERMS: *C.O.D. orders shipped net, F.O.B. Detroit. 5% discount allowed cash with order. All prices subject to change without notice, and all orders subject to confirmation by Kent-Moore Organization, Inc.*

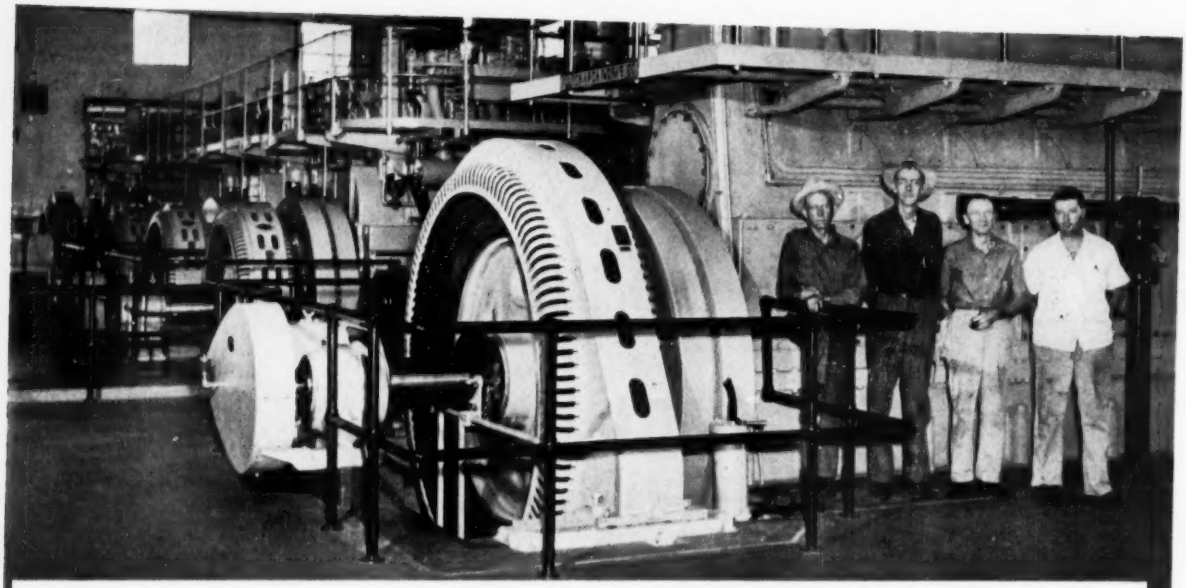
KENT-MOORE ORGANIZATION, INC.

Engineers and Manufacturers of Special Automotive Service Tools and Equipment

5-105 GENERAL MOTORS BUILDING • DETROIT 2, MICHIGAN

YOURS FOR THE ASKING! 24-Page Special Service Tool Guide for owners of G.M. Diesel Engines. Write Dept. D. for your free copy today!

NO STUCK RINGS OR CARBON, NEGLIGIBLE PISTON WEAR... *AND NO OIL CHANGE IN 14 YEARS!*



In 1937 the Municipal Light Plant, in Cushing, Okla., put Sinclair RUBILENE Heavy in service in its diesels. The oil has never been changed since! For semi-annual laboratory analyses of samples have always shown the oil to be in excellent condition.

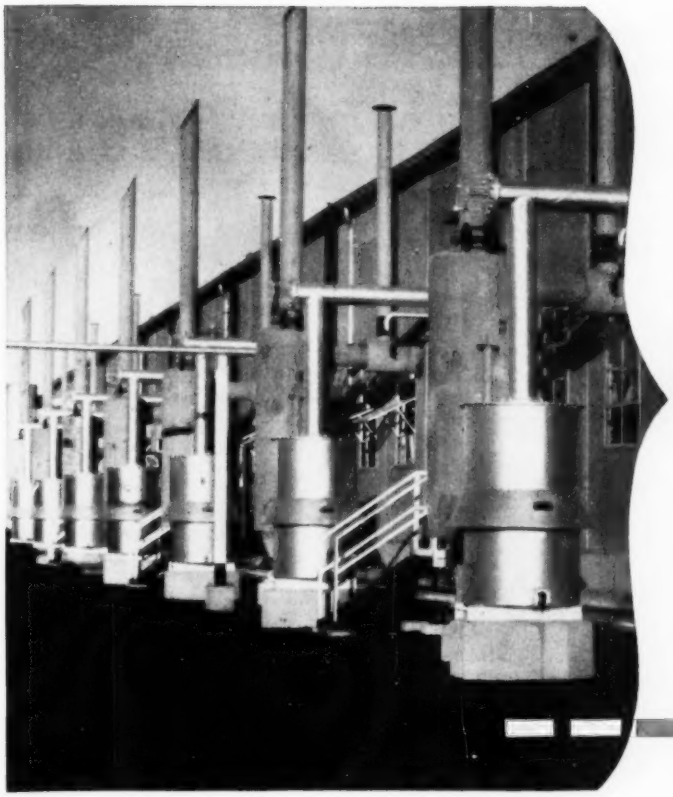
Inspections of the diesels have revealed no stuck rings, negligible piston wear. The crankcase and upper portions of the cylinders are exceptionally clean and bright, with no signs of carbon or deposits.

This is typical of the job that *RUBILENE*® has been doing for some 40 years throughout the nation. No wonder RUBILENE is first choice of many diesel engineers and has won the endorsement of diesel manufacturers.

SINCLAIR DIESEL OILS

save wear and replacements

For more details, see your nearest Sinclair Representative, or write direct to Sinclair Refining Company, 630 Fifth Avenue, New York 20, N. Y.



Every Cycoil is a SAVINGS BANK

Freedom from Dust-Damage Cuts Repairs and Costly "Down Time"

Each of the Cycoil Oil Bath Air Cleaners serving these eight 1200 hp engines actually "doubles" as a savings bank. The dust it collects represents hard cash that *won't* be spent on engine repairs and resulting shutdowns due to dust-damage.

Here's why you are assured of tangible, continuous savings over the years with Cycoil. This air cleaner is designed to operate at 100% efficiency in the removal of damaging dust. Over 90% of the total fine-dust content of the air is trapped by Cycoil oil-bath action even before reaching the filter pads. Positive oil circulation for continuous self-cleaning action, plus the added filtration to be had in the filter pads, results in approximately 100% clean air.

Write for Bulletin No. 130. It gives you the detailed story of Cycoil's proven design and high efficiency.

Today's Best Buy is Better Air!

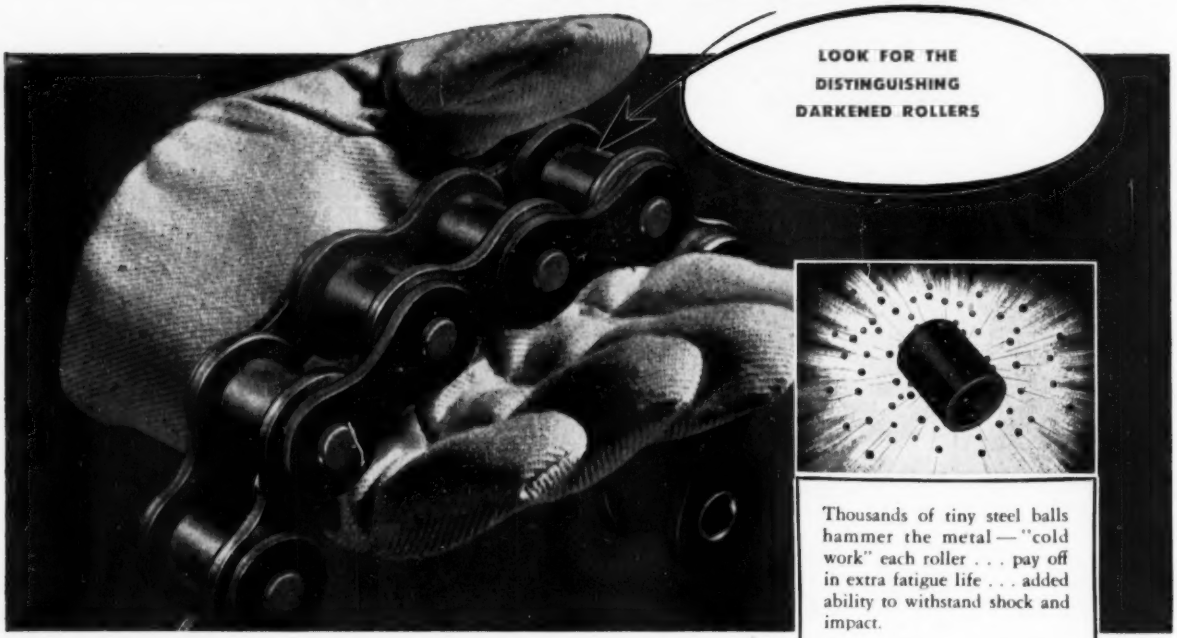
AAF

American Air Filter

COMPANY, INC.

445 Central Avenue, Louisville 8, Kentucky • Darling Bros., Ltd., Montreal, P.Q.

Here's how you can tell the chain with SHOT-PEENED rollers...



Thousands of tiny steel balls hammer the metal — "cold work" each roller . . . pay off in extra fatigue life . . . added ability to withstand shock and impact.

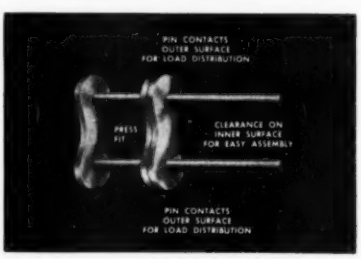
...the chain that has extra fatigue life

YES, you want to be sure you get shot-peened rollers on the next roller chain you buy. Shot-peening gives rollers the extra fatigue life needed to take repeated shock and impact loads.

These chains are high in tensile strength, durable under severe loads, relatively light in weight and uniform in pitch. This accounts for their wide acceptance throughout industry for both drive and conveying purposes.

Thanks to constant research and precise manufacturing controls, every Link-Belt Precision Steel Roller Chain meets the highest standards for uniform strength. You get a positive, long-life drive — unaffected by heat, cold or moisture.

Link-Belt Roller Chain is available in single or multiple widths, in 3/8 to 3 in. single and double pitch. For all the facts, call your nearest Link-Belt office.



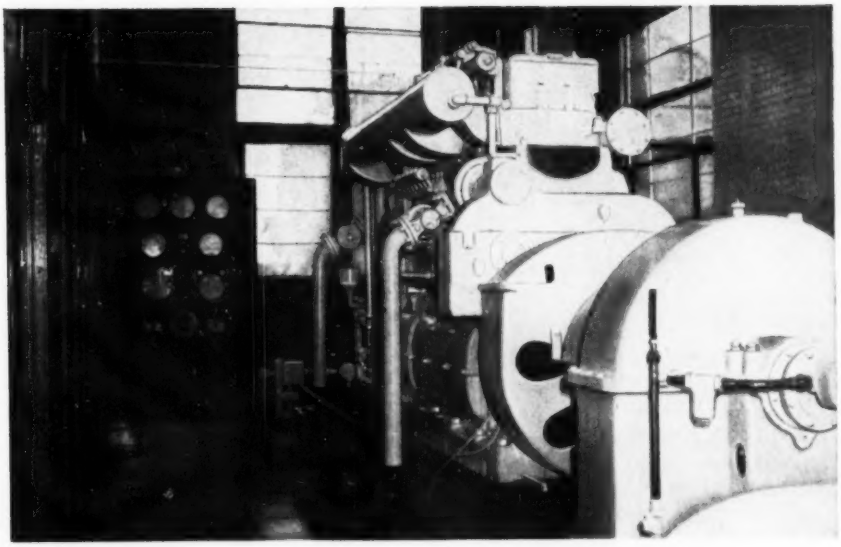
Easier coupling
and uncoupling without sacrificing load distribution

Patented E-Z Assembly feature of Link-Belt Precision Steel Roller Chain has won world-wide approval. Coupling and uncoupling of multiple width chains — right on the job — is far easier. There's absolutely no sacrifice of load distribution . . . no loss of the chain's remarkable performance. Press-fits between chain pins and middle bars have been modified. But full load carrying capacity across the entire width of the chain has been maintained.

LINK-BELT

PRECISION STEEL ROLLER CHAIN

LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities. 12.332



21,716 hours without forced shutdown

...and still going strong

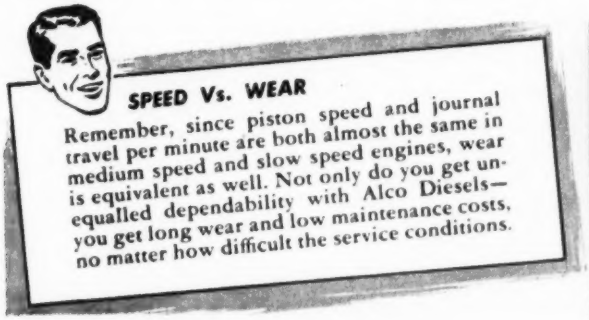
that's the record of this Alco Diesel Engine at Barnett Station of Shell Products Pipe Line

Listen to Mr. C. C. Curvey, chief operator at Barnett, Ill., speaking:

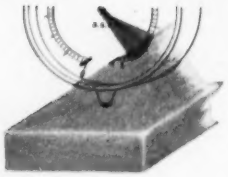
"The unit operates 24 hours a day and is never shut down except for the annual routine inspection and overhaul. . . . Not only have we boosted capacity of this line 15%, but operating and maintenance costs have been much reduced."

The Barnett station is equipped with a single Alco diesel—replacing a total of 3 old-type engines. This rugged Alco diesel provides power for pumping 1,050,000 barrels a month through the 8-inch pipe line. It's a 6-cylinder, 4-cycle engine with 12½ inch bore and 13 inch stroke, rated at 810 hp and 650 rpm.

Such power and performance can be yours, too, if you install Alco Diesel Engines to meet your pipe line pumping requirements. Your nearest Alco engineer will be glad to help. Call him today at sales offices in New York, Beaumont, Chicago, Cleveland, Houston, Kansas City, San Francisco, Schenectady, St. Louis.


SPEED Vs. WEAR
Remember, since piston speed and journal travel per minute are both almost the same in medium speed and slow speed engines, wear is equivalent as well. Not only do you get unequalled dependability with Alco Diesels—you get long wear and low maintenance costs, no matter how difficult the service conditions.

Beat Pressure...



GUN IRON CAST PARTS

There are three reasons why Gun Iron pressure castings are noted for outstanding service.

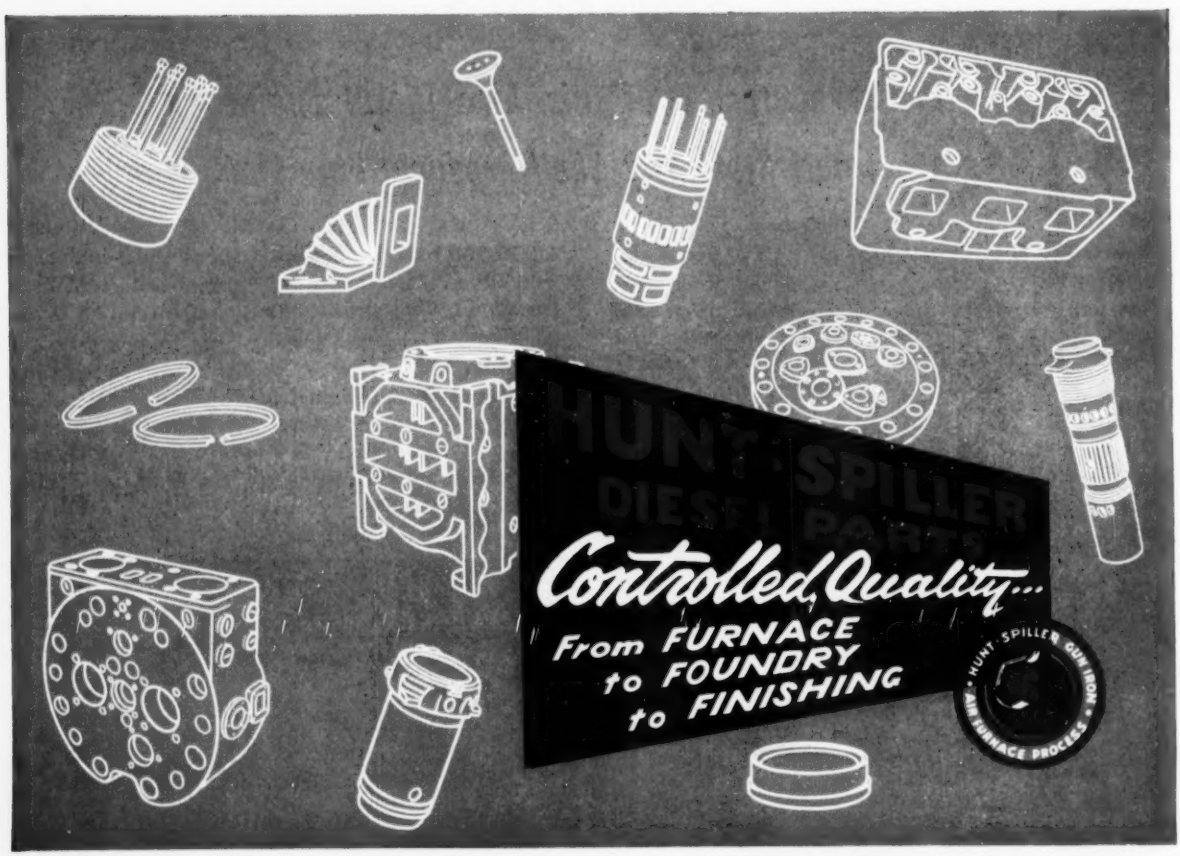
Gun Iron is produced by an air furnace process similar to open hearth steel. As a result, its microstructure is dense and close-grained and ideally suited to pressure-type, leak-proof castings . . . a fact proved in countless diesel cylinder heads. In addition, Gun Iron gives a bonus of great resistance to frictional wear, heat, erosion and corrosion.

In Hunt-Spiller's foundry are found the most modern methods and equipment for the production of porosity-free castings of all sizes—with the most intricate coring. And when desired, our extensive manufacturing department can machine the castings to fits and finishes that guarantee fine performance.

Why not investigate Gun Iron for your cast parts. Our engineers and laboratories stand ready to help you determine its value. **HUNT-SPILLER MANUFACTURING CORP., 373 Dorchester Ave., Boston 27, Mass.**

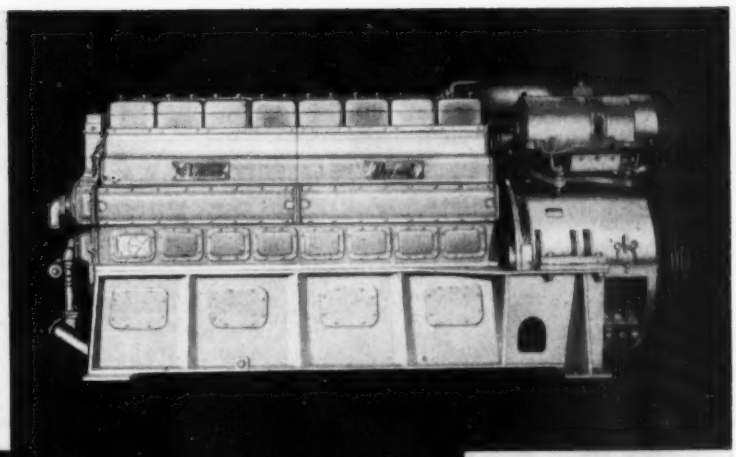
Canadian Representatives: Jos. Robb & Co., Ltd., 4050 Namur St., Montreal 16, P.Q

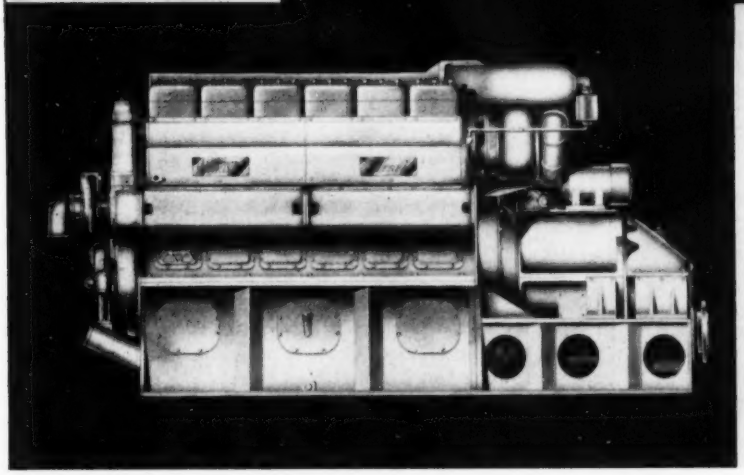
***HERE IS A PRACTICAL GUIDE** for the user of iron and steel castings . . . 24 pages of technical data on many types of metals and alloys. Write for your free copy.*



50 YEARS

OF EXPERIENCE AND PROGRESS





ABOVE

Sterling Viking Diesel 8 cylinder generator set rated at 600 KW.

LEFT

Sterling Viking Diesel 6 cylinder marine engine with reverse gear, rated at 665 HP in continuous service.

●

Descriptive bulletins on these and other Sterling Viking Diesel engines from 150 to 1000 BHP will be sent on request.

POWER to move ships and trains, to operate machinery or to light airports, means much more than merely installing an engine.

Fifty years of experience...broad and successful experience in applying power to just about every conceivable use is one of the reasons why Sterling engines are held in such high regard the world over.

Engineering progress is a second reason for Sterling preference. The best evidence of what constitutes success in engine design and performance is when customers come back for more.

We have the present day orders, facts and figures to show every marine and industrial user of power that Sterling's first 50 years marks just the beginning. *Talk to a Sterling Engineer.*

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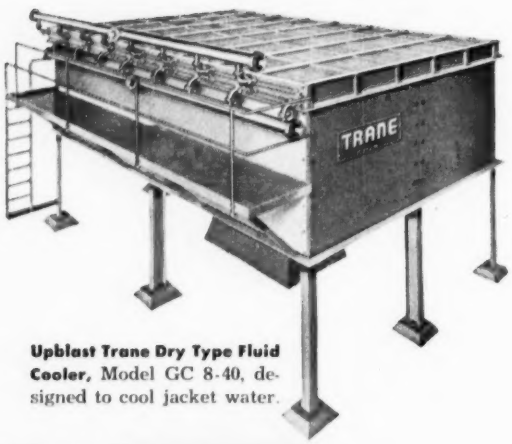
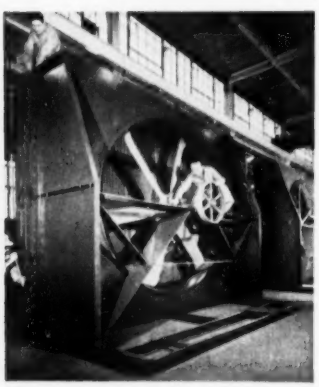
CUT DIESEL COOLING COSTS

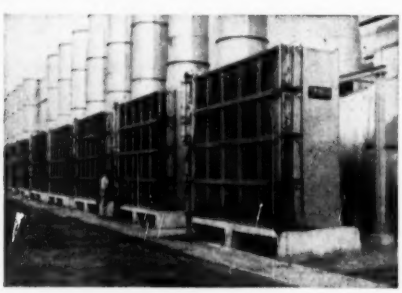
WITH TRANE DRY TYPE FLUID COOLERS



Upblast Trane Dry Type Fluid Cooler, Model GC 8-40, designed to cool jacket water.



Horizontal air stream model Trane Dry Type Fluid Cooler, Model EC 13-42, designed to cool water and oil.



120 Trane Fluid Coolers. Each one cools water and oil of an 1800 hp radial gas engine at an aluminum reduction plant.

Cut horsepower costs and *save* maintenance time when you use Trane Dry Type Fluid Coolers for your diesel and gas engine cooling. These units cool jacket water and lubricating oil without using refrigerants or water, and with only a minimum of power.

It's the careful engineering, the precise construction that allows the Trane unit to cool lubricating oil and jacket water (both at once, if you like) so efficiently. The flat plate-type fins and round tubes of the unit's core provide more heat transfer with less resistance.

Tubes are bonded to fins mechanically. This solderless bond is as durable as the metal itself and adds years of service to Trane Fluid Cooler life. Heat transfer is faster and more complete; the unit does a bigger, more economical cooling job. The wide range of standard Trane Coils available for the core can produce the exact circulation and heat transfer rate for any size of unit.

Ruggedly built, the Fluid Cooler can perform effectively indoors or outdoors under the roughest conditions, taking wind and shock load without added bracing. The unit is husky enough to take the added shocks of portable installations.

With Trane dry-type diesel cooling, air is the coolant, so there's no water to replace or to treat, no sediment to remove. Maintenance is simple and seldom. All parts are easy to reach for servicing. Coil headers are outside the casing, and motors are conveniently placed. Coil tubes are cleanable.

Two types of Trane Dry Type Fluid Coolers, in 22 sizes, answer virtually any diesel cooling problem with a standard unit. These two models are the EC units, with horizontal air flow, and the GC units, with air flowing upward through the coil.

Trane Fluid Coolers normally have steel casings, aluminum fans, copper tubes and aluminum fins. However, the units can be furnished in special constructions and materials to meet almost any job requirements.

TRANE

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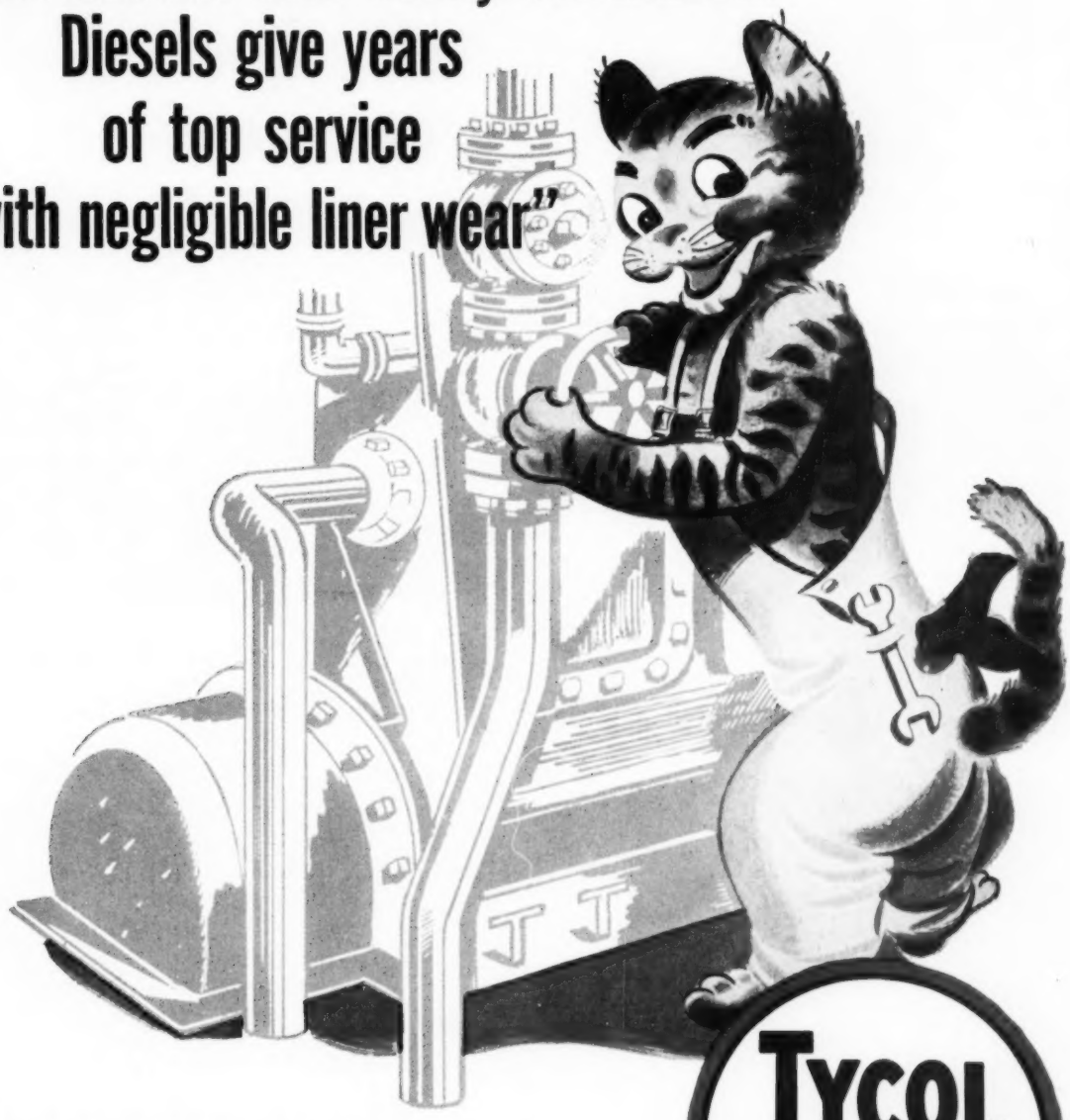
Eastern Mfg. Division, Scranton, Pennsylvania
Trane Company of Canada, Ltd. . . . Toronto
OFFICES IN 80 U.S. and 14 CANADIAN CITIES

MANUFACTURING ENGINEERS OF HEATING, VENTILATING, AIR CONDITIONING AND HEAT TRANSFER EQUIPMENT

"Tycol Adelbus cuts costly overhauls... Diesels give years of top service with negligible liner wear"



Exactly! Tycol Adelbus Diesel Oils are fortified with selected additives that provide a tough "film of protection," and help to eliminate sludge and varnish. They have excellent detergent-dispersive characteristics and amazing resistance to heat... assure the piston seal that means FULL power and economy . . . and provide exceptional resistance to oxidation.

Complete information about Tycol Adelbus Diesel Oils is available from your nearest Tide Water Associated office. Call or wire now.

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Longer and wider—yet more nimble and maneuverable—than smaller buses, the Mack C-50 represents the most modern way of handling heavy passenger traffic in densely traveled big-city streets. Not just a stretched-out smaller bus, it is designed and built in every component and in every detail to carry as many as 50 seated passengers and 85 standees—with a new degree of comfort and safety . . . without sacrifice of mobility or performance. And like all Mack buses, the C-50 helps your *operating* dollars go farther, your *maintenance* dollars go farther, your *invested* dollars go farther—through proved economy, dependability and long life.

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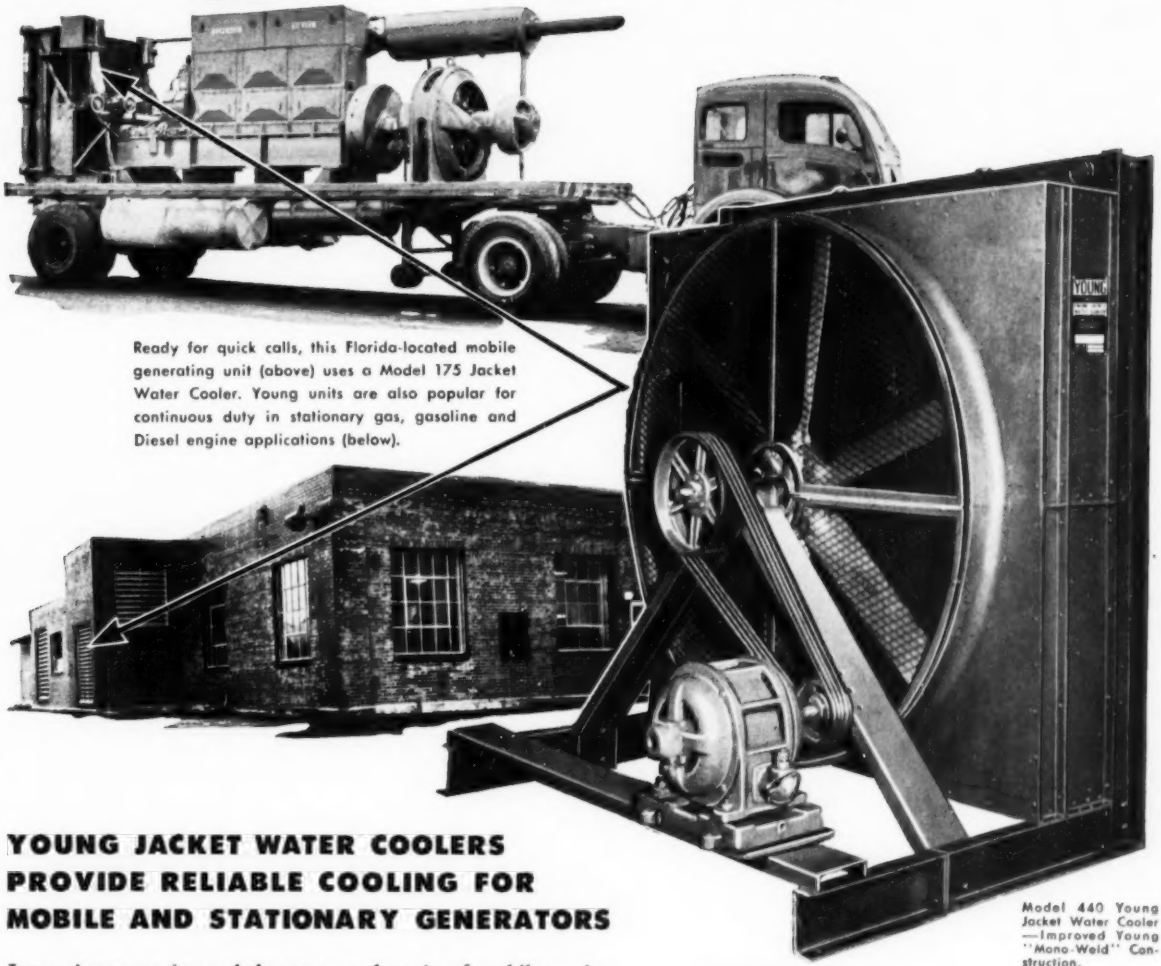
KEEPING ENGINES COOL IN AN *Emergency!*



Ready for quick calls, this Florida-located mobile generating unit (above) uses a Model 175 Jacket Water Cooler. Young units are also popular for continuous duty in stationary gas, gasoline and Diesel engine applications (below).

Model 440 Young Jacket Water Cooler —Improved Young "Mono-Weld" Construction.

YOUNG JACKET WATER COOLERS PROVIDE RELIABLE COOLING FOR MOBILE AND STATIONARY GENERATORS

Intermittent service and the stress and strain of mobile equipment are rigid tests for any cooling unit. Young Jacket Water Coolers are a favorite for such duty because they are ruggedly built, reduce failure experience—are always ready in an emergency.

Extra strength is now built into every Young Jacket Water Cooler. From the "Mono-Weld" welded steel top and bottom tanks, *vertical* tubes, and steel center support, to the heavy steel channel framework, they're built for the life of the power plant. Oil and/or gas cooling coils may be mounted between the fan and liquid cooling core. Catalog No. 1351 will soon be off the press. Reserve your copy today.

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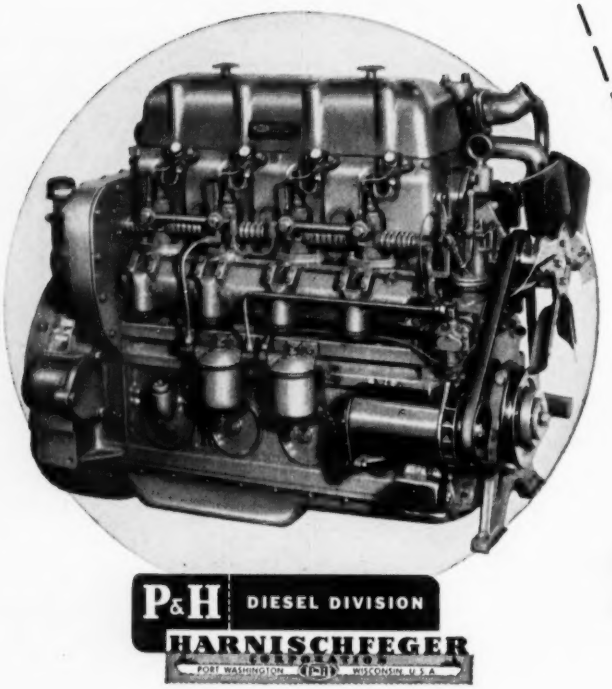

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Two great names, Harnischfeger and Bendix, join in the creation of a line of Diesel engines in which, for the first time, all major castings are of light-weight alloys. The result—less weight per horsepower and rugged design for the toughest jobs. More and more diesel manufacturers are looking to Bendix for the best solution to their fuel injection problems. For Bendix has the engineering know how and the manufacturing experience that assures dependable performance and low operating costs on all types of diesel operations. That's why it pays to specify Bendix for the finest in fuel injection equipment.

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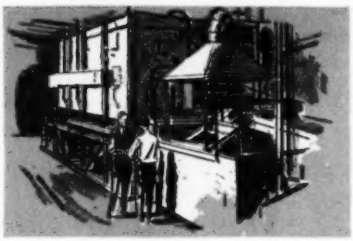

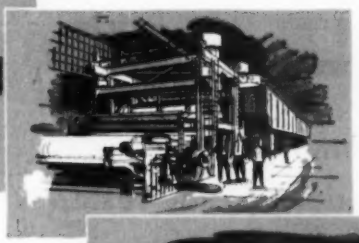

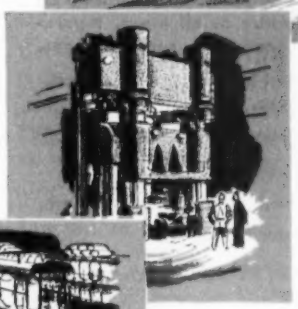

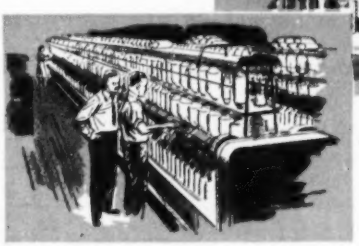

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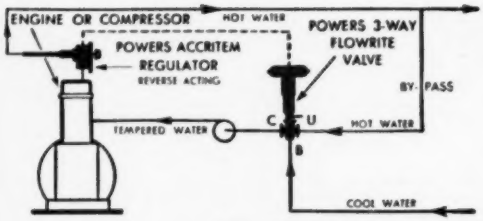

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—Provides positive, dependable control for large size 3-way or 2-way valves. ***Safety feature*** of hook-up above: failure of air or water pressure allows only cooling water to flow through the valve to engine.

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- **Saves Labor; increases efficiency.**
- **Reduces danger of piston seizure.**
- **Eliminates sludging.**
- **Lowers fuel and lube oil consumption.**

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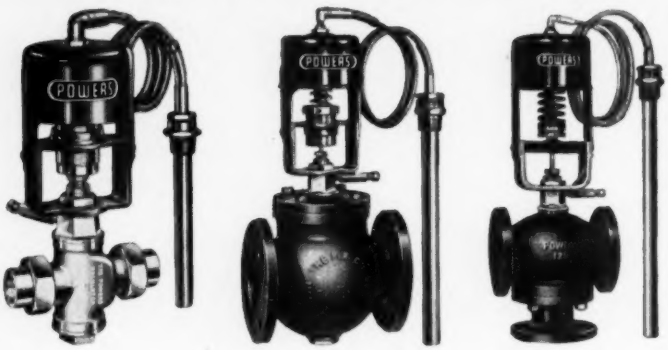
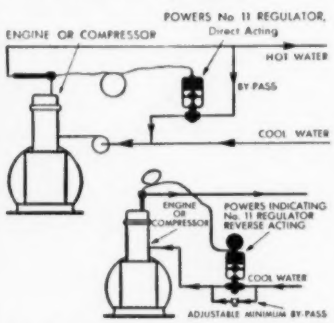
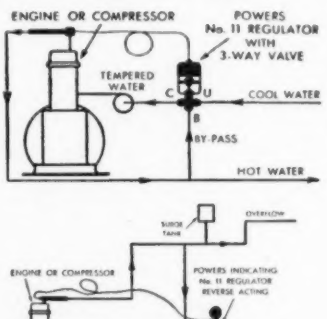
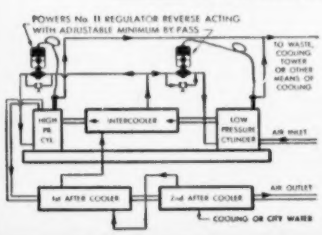
No. 11 Self-Operating TEMPERATURE REGULATORS



Provide dependable control for most applications. They're simple, ruggedly built, economical and easy to install. Especially suited for air compressors, diesel and gas engines. Temperature indicating regulator also available.



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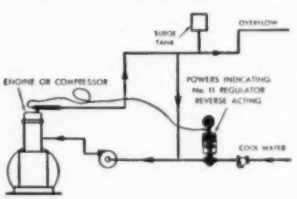
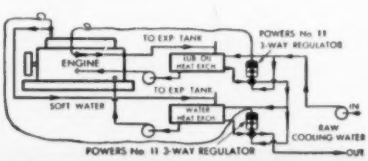
HIGH PR. CYL.
INTERCOOLER
LOW PRESSURE CYLINDER
AIR INLET
1st AFTER COOLER
2nd AFTER COOLER
AIR OUTLET
COOLING OR CITY WATER





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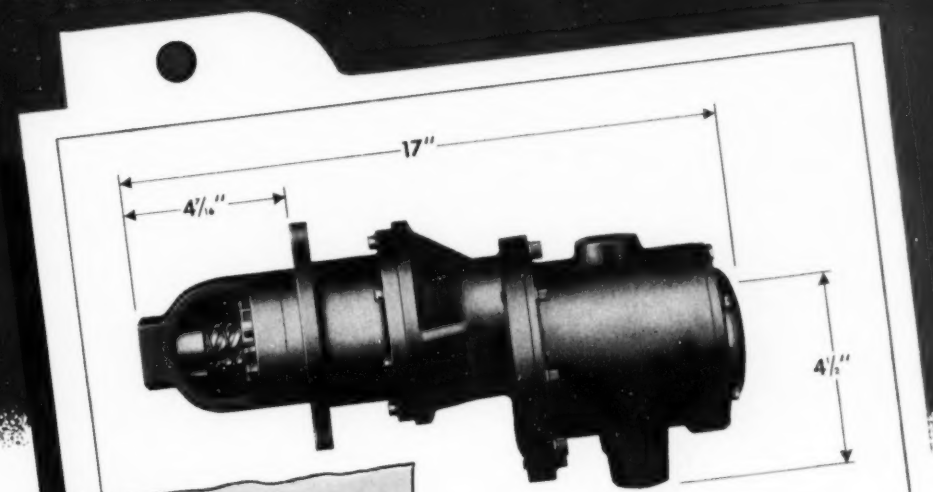

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A powerful Multi-Vane air motor starts the engine through a standard Bendix drive, that matches the performance characteristics of the air motor. Air Cranking Motors cannot be burned out, or damaged by stalling. Their use also eliminates expensive repairs frequently caused by climatic conditions that deteriorate the insulation on electric motors. In many instances the yearly replacement cost of storage batteries pays the initial cost of an Air Cranking Motor.

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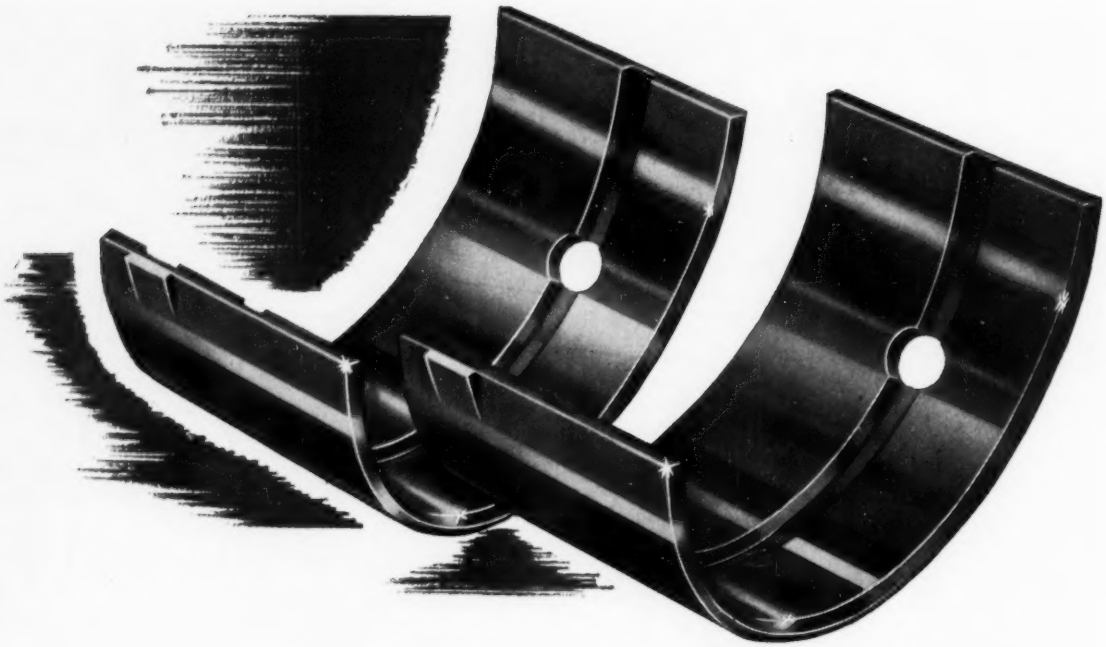

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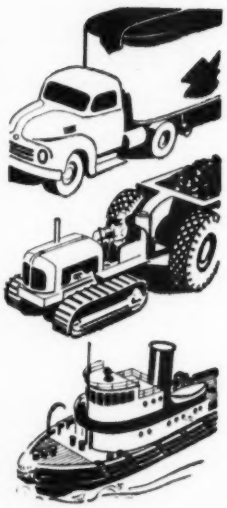

Monmouth Bearings are engineered and precision made to safeguard the reputation of the master Diesel engine mechanics and to insure user safety and satisfaction.

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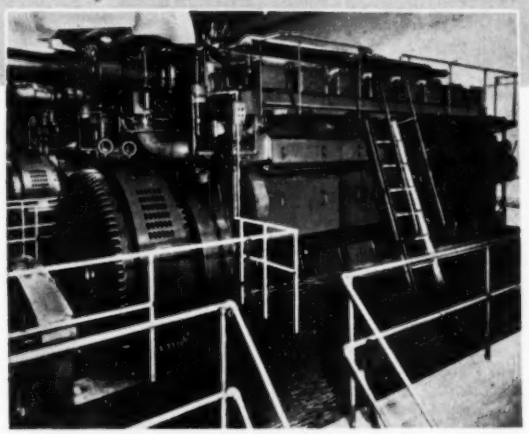
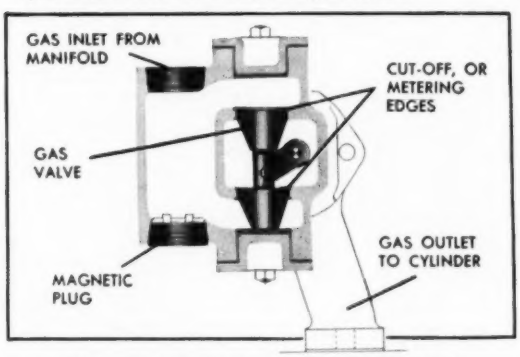
They're Handling Expanding Power Loads The Fast, Low Cost Way:

Iowa Utility Company, Like So Many Others, Uses Worthington Dual Fuel Units For Uninterrupted Service On The Cheapest Fuel Available



A Worthington Supercharged Dual Fuel Engine in the Oskaloosa plant — part of the Iowa Power And Light Company System.



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One for each cylinder

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They're saving money for their users every day, too, because of their Worthington-pioneered dual fuel feature that enables them to operate on gas or oil, or any combination of these fuels. Also, without losing load, they can instantly be changed over from one fuel to the other.

When gas is your fuel, only a very small amount of pilot oil is needed for ignition. Micro-metering valve (see drawing) on each cylinder provides equal distribution of gas for smooth, steady operation. Supercharging assures maximum economy through high thermal efficiency with either fuel.

BESIDES FUEL SAVINGS--

Lubrication and maintenance costs have been cut to a minimum through an effective system of "hot-spot" lubrication, according to users of Worthington Dual Fuel Engines. Why not get the whole story that proves *there's more worth in Worthington?* Write to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.*

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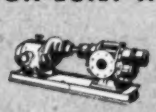

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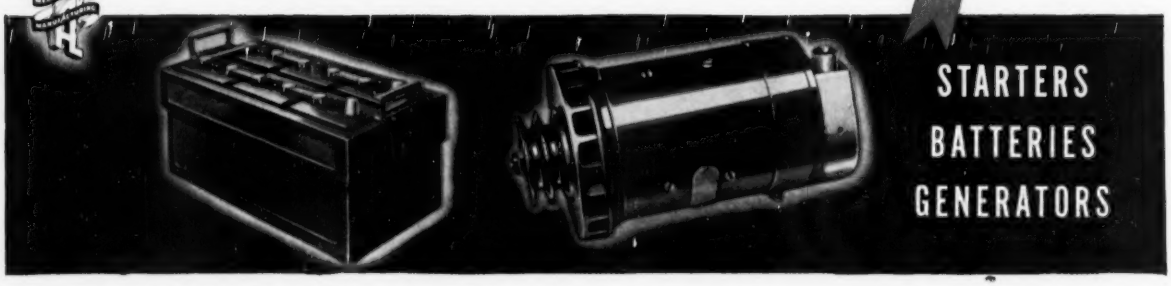

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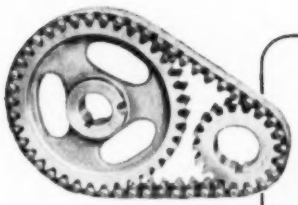
. . . with the world's finest timing chain from the world's largest chain plant



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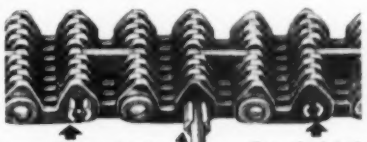
Let our engineers cooperate in the proving of your latest engine. We will gladly supply a test drive to your specifications. Details are in engineering catalog No. 2065.

WHY SEGMENTAL BUSHINGS MEAN BETTER PERFORMANCE FOR YOUR ENGINE



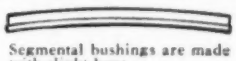
Removable case-hardened segmental liners or bushings extend across entire chain width—double bearing surface . . . halve bearing pressure on joint

Broached holes in links form lock grip for bushings

Smooth, case-hardened pin, free to rotate between segmental bushings, presents every part of surface for wear

Bushing takes wear at joint—elongation of link hole or eye is negligible

AUTOMATIC JOINT SNUGNESS

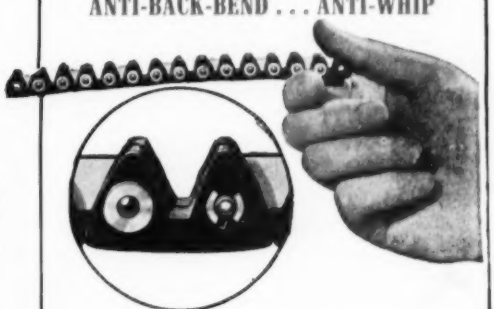


Segmental bushings are made with slight bow

After initial assembly in chain, bushings are straight

Bow in bushing acts to keep a snug joint, maintaining chain pitch

ANTI-BACK-BEND . . . ANTI-WHIP



Built-in check in joint limits bushing rotation, checks back-bend and whip

Great flexibility of Link-Belt Duplex Timing Chain is exploited for timing and fuel pump drive on this engine. Either face of the chain meshes with wheels.

12,350

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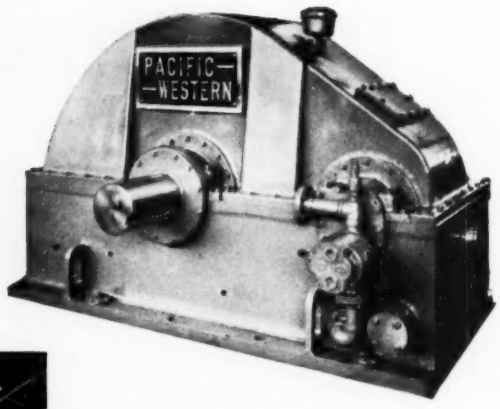
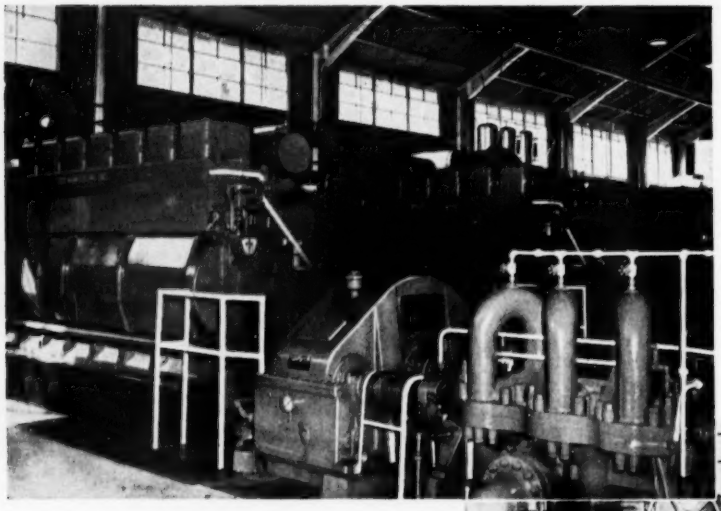
CHOSEN FOR BIG PIPELINE PUMPING JOBS





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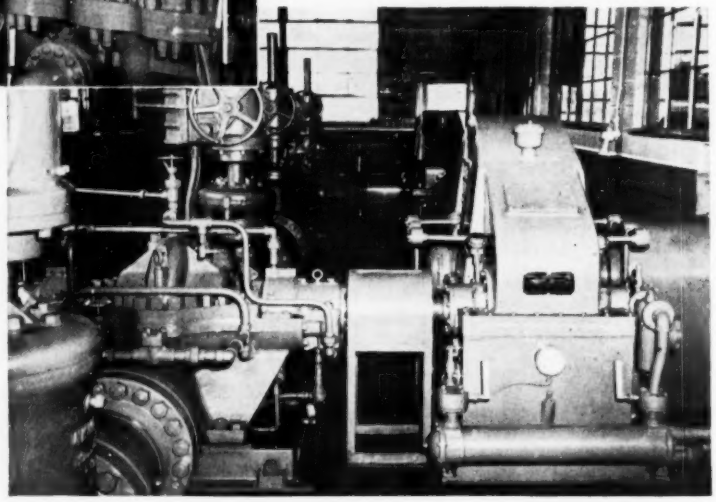
This new 112-mile, 14-inch oil line, with a capacity flow of 75,000 bbl. a day, has a rise in elevation of more than 3500 feet. Pumping capacity and dependability is obtained through six Pacific-Western speed increaser units. Diesel-power input of 1,000 hp at 450 rpm is stepped up to 3,600 rpm output.



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The largest speed-increasing units ever built for U. S. pipeline service were furnished by Western Gear for this 1000-mile pipeline. On the main line four units of 1,700 hp, and four of 1,200 hp are used to drive pumps to obtain 157,000 bbl. per day capacity. Extensions of the line will utilize additional units.

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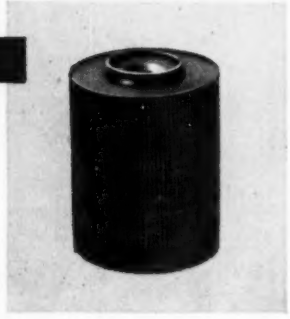
Protection PLUS *for Diesels*

FOR FUEL FILTERS



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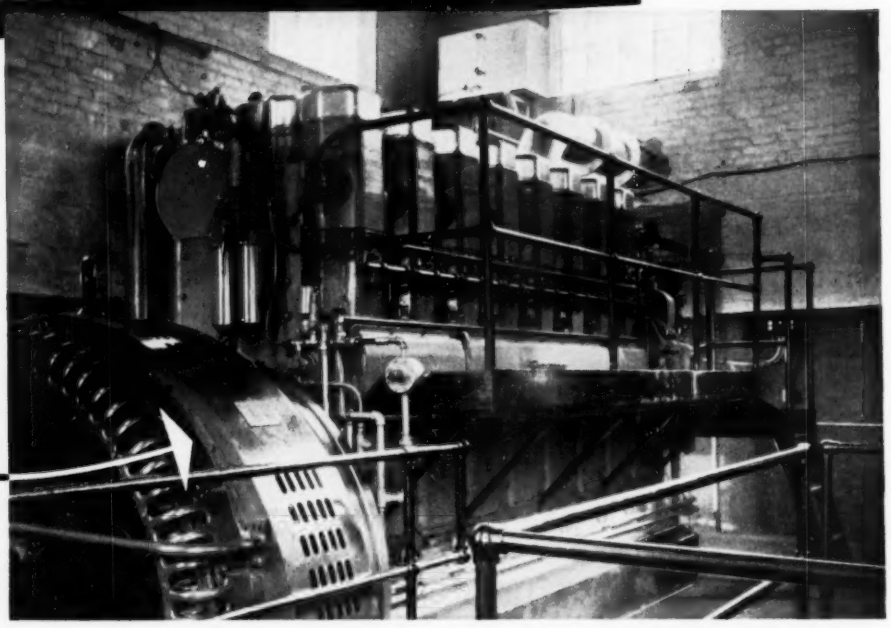
This 925 H.P. ENTERPRISE DUAL-FUEL ENGINE



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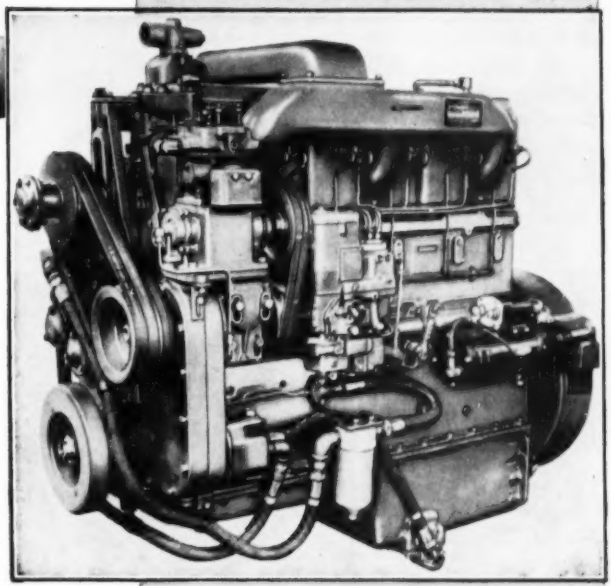

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Vol. 29 No. 6 June, 1951

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Editorial:

Let's Not Kill the Goose....

THIS reactionary individual subscribes wholeheartedly to the homely philosophy that this country was made great by free men engaging in free enterprise. We even feel that a legitimate objective of business is to make money — not fabulous amounts, but enough to pay the way with a little left over for bad times. By old fashioned economic standards this led to sound business organizations, greater security for employees and a building up of national economy.

All this is now changed; at least, if Washington's actions are taken at face value. Directives, legislation, higher taxation, all have interfered with the business man's method of building not only for today, but for the future. Now, we have material controls and pricing regulations to further complicate things.

It should be apparent to all that the nation is in terrible danger. It is probable that in such situations, human nature being what it is, some regulation is necessary to accomplish a national objective. Whatever the merits of the case, one point is clear—if government is to usurp the rights of business, it must assume the responsibility of assuring continuance of the system that made this country great. In short, let's not kill our way of life while trying to safeguard it.

We could illustrate this point by reference to our own industry, but to be a little more objective, let's take a look at an allied field. Mr. Tell Berna, general manager, National Machine Tool Builders' Association, outlined the situation very well at the 15th annual Machine Tool Electrification Forum sponsored by Westinghouse.

Poor financial position of the industry was attributed to the drain by excess profit taxes and unwise renegotiation; the post-war demand picture was clouded by competition from enormous government machine tool surpluses dumped at 10 to 15 cents on the dollar. With shrinking demand, firms were sold or failed; skilled labor was dissipated to other industries. Result — a serious loss of capacity and potential.

Explanations of the Industry Advisory Committee in Washington evoked little response in spite of the evident truth that the backbone of production is machine tools. Material shortages were acute and there was no clear cut DO assistance.

Placing of pool contracts was designed to help but the General Service Administration (placing the orders) had limited funds. Furthermore, priorities to obtain materials for machines to be built in the future was not as pressing as material requirements for completing the machines on the assembly floor. Net result is that production has not increased to keep pace with demands.

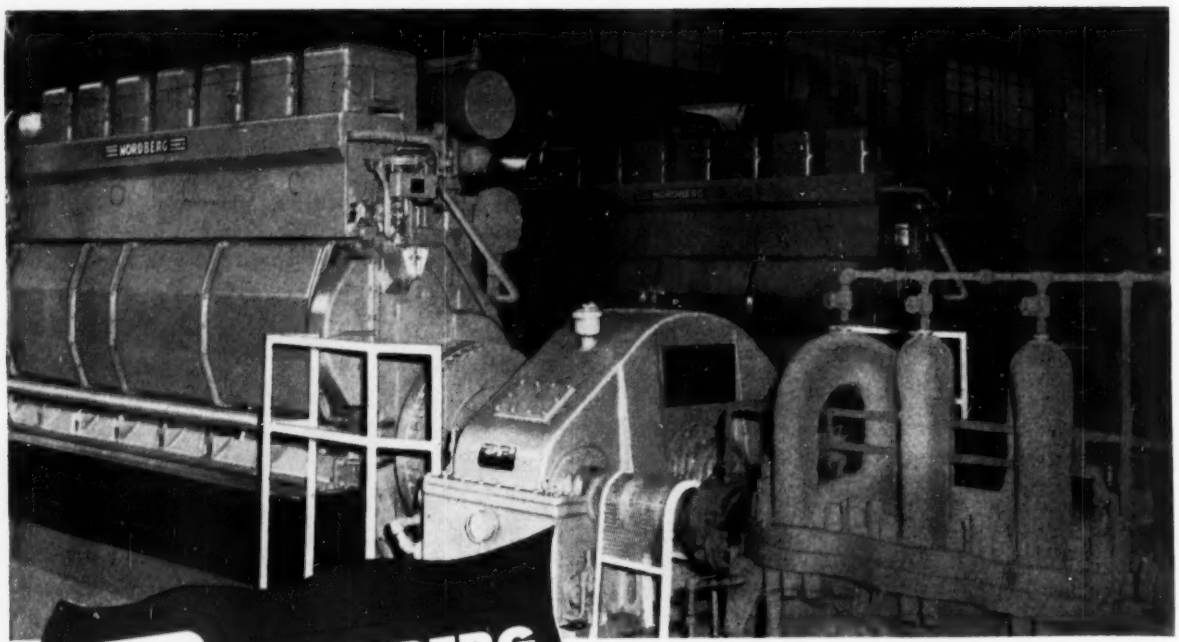
The incentive of Certificates of Necessity has not applied to any great extent. One certification received by a tool builder after much delay permitted only 75 to 85 per cent recovery of the investment. Anticipation that there will be little use for expanded facilities after the defense program deflates the "incentive".

Other difficulties such as the problem of financing expansion exist, but the most serious hurdle of all is price control. Today's maximum price is figured on the "delivered" price in the base period ending January 19, 1951. Quotations on machines shipped in this period may have been written in late 1949 or early 1950, and based on prices printed in 1947 or 1948. The roll-back is then from two to four years. It is a rare combination of circumstances that permits a manufacturer to ship a machine at his 1951 prices in January of that year.

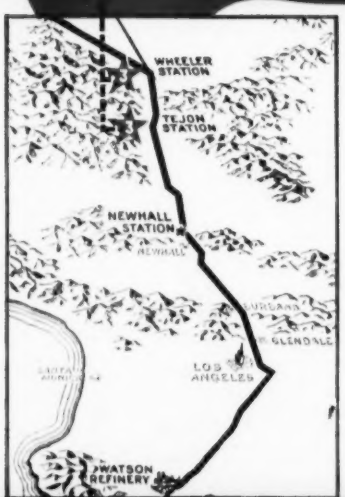
Direct labor costs are all that can be added to the unrealistic base price. No provision is made for overtime, so labor will go where they can earn overtime pay. Additional cost of subcontracting is not recognized. There is no mention of contract costs.

Here, we see a ridiculous picture of an essential industry tied hand and foot by government policy. Note that it bears a strong ressemblance to the situation in the diesel industry.

In war or peace, the profit incentive still remains the strongest motivating force in speeding production. The present situation pursued to the ultimate will only result in unprofitable operation that means business failure or subsidy. In either case, it is the destruction of what we are fighting to save—strong, sound, free enterprise.



6 NORDBERG Duafuel* ENGINES supply 6300 horsepower for new RICHFIELD PIPE LINE



ILLUSTRATED here are three of six Nordberg Duafuel* Engines installed in the Tejon and Wheeler Ridge pump stations of the new Richfield Oil Corporation 14-in. pipe line, which connects the company's production in the San Joaquin and Cuyama Valley fields with the Los Angeles area. These dependable 7-cylinder Supercharged Nordberg Duafuel* engines each develop 1050 hp at 450 rpm, and are designed to operate on natural gas plus Cuyama Crude as pilot oil, on straight Cuyama Crude, or with any proportion of either fuel. Instantaneous conversion from one fuel to another allows the most economical fuel to be used at all times.

For main line or booster stations—wherever you must keep petroleum products on the move with plenty of power—you can count on Nordberg engines to do a dependable, economical job, day-in, day-out. Built in a wide range of sizes up to 9600 hp, including 2 and 4-cycle types, and Diesel, Natural Gas and Duafuel* models. (**Trade Mark*)

Write for further details, outlining your power requirements.

NORDBERG MFG. CO., Milwaukee 7, Wis.

Four-Cycle Diesel Plant — BUSCH-SULZER DIVISION — St. Louis 18, Mo.

0151

BUSCH-SULZER
A DIVISION OF NORDBERG

NORDBERG
DIESEL ENGINES

+ HIGHLIGHTS +

● In 1950 gas use was up 14.2 per cent in electric power plants.

● The use of heavier grades of fuel oil are being given much thought by British engine manufacturers.

● A controlled flow of 450,000 bbl. per day is the output of the Abqaiq, Arabia field.

● The Baltimore and Ohio is now grinding the wheels of their diesel locomotives without removing the wheels from the engine.

● Federal gasoline tax of 1½ cents per gallon cost taxpayers more each year than the total tax receipts of the national government from all sources 35 years ago.

● Canadian Locomotive Company's Kingston plant is being converted to the production of diesel locomotives. The first unit is expected to be completed in June.

● During the first quarter of this year, the value of GM sales to the government including research and development contracts, totaled approximately $100 million.

● The Great Northern Railway inaugurated the new dieseled powered train, The Empire Builder, June 3, 1951, between Chicago and Seattle-Portland. Time for the 2211-mile run will be 45 hours.

● A new development in petroleum pipelines is the use of aluminum pipe. Such pipes are easier and less expensive to lay than steel, do not have to be wrapped, and do not require preliminary cleaning. In operation, aluminum pipe has less internal friction than steel pipe.

● Of the 1755 locomotives on order by Class I railroads, 1433 were diesel-electric, 18 steam, and 4 electric.

● Average daily production of aluminum is now 4½ million lbs. per day.

● Engineering graduates are sitting back and taking their pick of jobs this year.

● Anaconda Copper Mining Co. at Cutbank, Montana will receive natural gas from the Manyberries area in Alberta, Canada.

● Baldwin-Lima-Hamilton, in a recent six weeks period received orders for 101 diesel-electric locomotives having a total value of about $15,000,000.

● United States Army Transportation Corps has ordered forty-one 800-hp. switching locomotives and accompanying spare parts from the EMD of GM.

● Recent investigations by the National Bureau of Standards have shown that battery additives, which are supposed to rejuvenate "dead" batteries, have no effect on battery life or performance.

● Bids are being solicited from private salvage companies by the Office of Naval Material for the salvaging of 400,000 tons of scrap metal from sunken Japanese ships in various Pacific islands.

● England exported generating sets, generators, and parts to the U.S.S.R., valued at over £6,000,000. The British magazine *Oil Engine* points out that these units are needed at home (to say nothing of helping our enemy).

● The daily world production of oil is now 10 million bbl.

● Truck registrations increased 7.2 per cent and bus registrations 7.1 per cent in 1950 over 1949.

● North Dakota recently became the 27th state to produce crude oil. More than half the state is at present under lease to oil companies.

● There have been 173,152 new freight cars ordered in the United States since the start of hostilities in Korea.

● Attendance at the session on water conservation indicated the growing interest and concern of engineers in this topic.

● The Central Military Procurement Information Office has revised the "Index of Military Purchasing Offices: A Guide to Industry in Selling the Military Departments."

● The Canadian Board of Transport Commissioners have recently ruled that horns on road diesel locomotives must be tuned in chords of not less than three tones within a year.

● The Munitions Board, and the military services are putting into effect new procurement policies that will give small businesses an equitable share in the rearming program.

● In a recent lecture by Sir Harry Ricardo, the possibilities of a sleeve-valve diesel engine were discussed. Many British gasoline aircraft sleeve-valve engines have been built and have acquited themselves well.

Modern building of the Pittsfield, Illinois plant of the Rural Electric Company.

Illinois Co-op Builds Modern Plant

*by Sanford K. Fosholt**

For those desiring to design and build a power plant this article could well serve as a guide. Concepts of modern plant design change along with everything else and here is an up-to-date version. Attention has been given to all of the important considerations—both functional and otherwise. Even those engineers of plants that "just grew like Topsy" will get some ideas for future alterations and additions.

In 1950, the Illinois Rural Electric Company, with offices at Winchester, Illinois, placed in service a new diesel generating plant near Pittsfield, Illinois. This new plant includes three Worthington 1160-kw. supercharged diesel units arranged for future dual-fuel operation on oil and natural gas. The new plant embodies latest features of equipment and plant design with emphasis on those features which improve economy, convenience and ease of operation, comfort for operating personnel through cleanliness and control of noise, and dependability with minimum effort on operation and maintenance.

History

The Illinois Rural Electric Company, an REA cooperative serving rural consumers of electrical energy in an area embracing approximately 2500 square miles in west central Illinois, was organized in 1937. Its initial electrical facilities consisted of 1200-kw. diesel generating plant located near Winchester, Illinois, a 23,000-volt transmission line with three step-down substations, and a 12,500/7200-volt rural distribution system, all of which were placed in operation in 1938. At the end of 1938, the Cooperative served approximately 900 members. It now serves over 6,000 members.

The area served by the Cooperative is divided into two parts of approximately equal size by the Illinois River. The initial diesel plant (Winchester plant) was located roughly in the center of the area lying east of the Illinois River. The area west of this river was served from the Winchester plant through one 23,000-volt transmission line crossing the river.

In 1944, when it became apparent that additional capacity for generation, transmission and distribution would soon be required, the Cooperative called upon their consulting engineers, the Stanley Engineering Company, Muscatine, Iowa, for a detailed engineering study and the preparation of a long range plan of development for the entire system. The plan which was adopted involved the addition, over a period of years, of 2100-kw. of capacity to the Winchester plant, additional transmission and distribution facilities, and the construction of the new Pittsfield diesel generating plant.

Pittsfield Plant Site

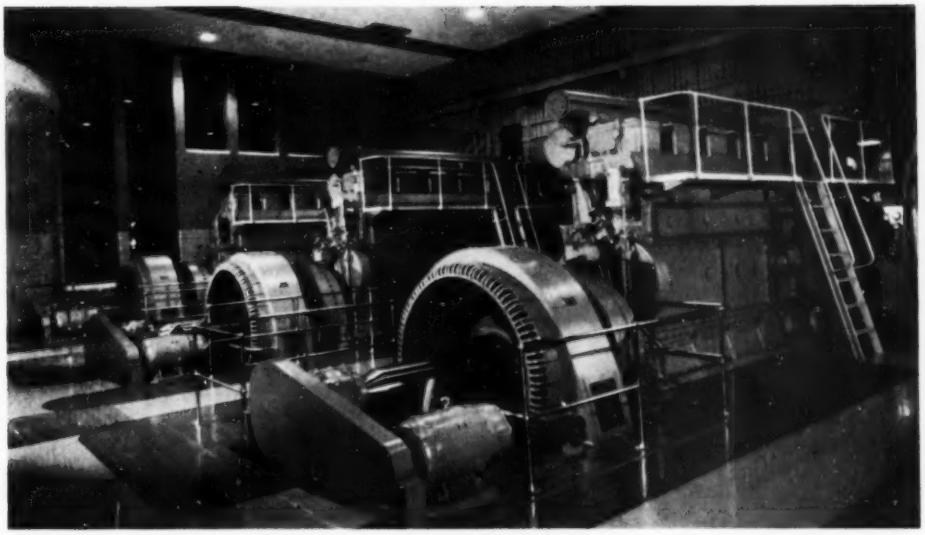
For the new diesel plant a site just north of the City of Pittsfield, Illinois was selected because this location offered advantages on the following points:

1. It was located near the center of the load area lying west of the Illinois River and it thus provided a more firm source of energy than had previously existed in the transmission line crossing the Illinois River.

2. Good transportation facilities were available, including a paved highway and a railroad adjacent to the site.

3. Satisfactory living conditions were available for the operating staff.

**Stanley Engineering Company, Muscatine, Iowa.*



Engine room of the Pittsfield, Illinois plant with three Worthington diesel generating units.

4. A future natural gas supply could be secured at the plant site.

5. Water could be secured from the city water system which included a main crossing the plant site.

6. Connection could be made to a city sewer at one edge of the plant site.

7. Adequate space was available on the plant site for future development.

8. The site allowed routing of transmission lines without undue difficulty.

In determining the arrangement of structures on the plant site, a lay-out permitting future construction of a railroad siding onto the plant site was selected. This also allowed adequate space for future construction of a warehouse adjacent to the railroad siding. Since the major portion of the site was located on a side hill slope, special attention to arrangement of other structures was required, and the main power plant building was set to take advantage of the slope by providing storage space, garage and water treatment room in the basement with direct entrance from ground level.

The main building entrance and lobby were also incorporated into the front corner of this same end of the plant and the building was oriented at an angle with respect to the highway to present to the the main approach the attractive architectural appearance of the main entrance.

On entering the main entrance from ground level at the parking lot and passing up a flight of stairs, the visitor passes the office and then may enter the main engine room. This arrangement allows control of visitors from the office. The office is adjacent to the engine room and the operating aisle can be observed from the office through double glass windows which minimize plant noise.

On entering the main engine room, the operating aisle lies directly ahead, the main engine room is on the right and the switchgear and service bay is on the left. Above the operating aisle is a balcony or walkway reached directly from each engine operating platform. This balcony provides access to a series of small rooms above the switchgear bay which contain the exhaust silencers, air intake filters and jacket water expansion tanks.

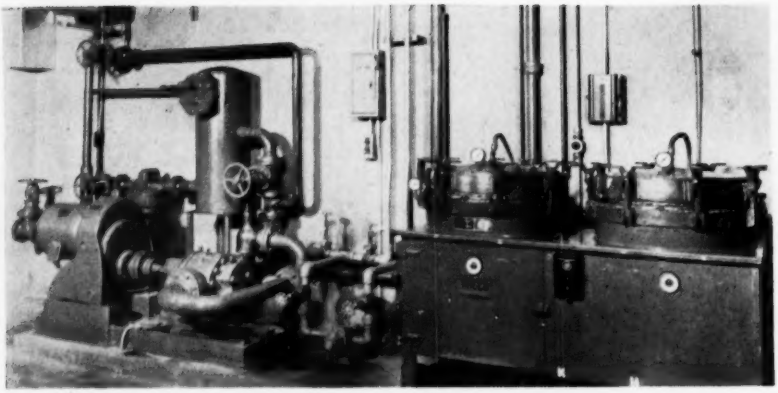
The repair shop is entered from one end of the service bay and a locked instrument room is provided adjacent to the shop. A locker room and a washroom are located at the end of the operating aisle between the entrance hall and the shop. Stairs down from the service or switchgear bay lead to the auxiliary room in the basement where all pumps, heat exchangers, and other auxiliary equipment are located. This room opens to the water treatment room, the storage room and the garage at ground level which permits convenient handling of equipment from ground level through the garage to the auxiliary room in the basement.

At the rear of the power plant building, parking space is available for the operating staff and access to the rear of the engine room is direct from ground level. The outdoor substation is located approximately 200 ft. from this end of the plant and allows adequate space for future extension of both the substation and the plant proper. Vertical, outdoor, above ground, bulk fuel oil storage tanks and the cooling tower are also located behind the plant approximately 150 ft. from the auxiliary bay in the basement.

Building

The power plant basement structure is of reinforced concrete with a shallow basement around the diesel engine foundations to allow access for piping, electrical circuits and minor auxiliaries. The main basement auxiliary room (at the front end of the engines and below the switchgear bay) is 12 ft. deep to allow adequate space for auxiliaries.

Exterior building walls are of mat-faced brick with green window trim except for the rear end wall which is of steel panel construction to facilitate removal and relocation when the plant is extended. Interior engine room walls incorporate a glazed tile wainscoat with green concrete block above the wainscoat to aid acoustical features. The engine room ceiling is white acoustical material; floors are dark grey with light grey walkways and red borders; generating units are



Fuel oil unloading pump, meter, and air eliminator at left, a small lube oil transfer pump in center, and the Hilco lube oil reclaimer at right.

dark green; control panels are tan; the engine room crane, operating platforms and railings are yellow and the switchgear bay ceiling is a light green. A color code has been used on the piping, conduit and auxiliaries in the basement.

Mr. Stanley R. Farris, general manager, and Mr. Harry Collins, superintendent of generation for the Cooperative, believed that careful selection of colors together with proper acoustical treatment would pay good dividends in the form of better operation through comfort; pleasing, distinctive, and effective appearance; and psychological influence of proper contrasting colors. The results have confirmed their beliefs.

A 5-ton crane is installed in the engine room for maintenance and installation service. This crane uses an electrically operated hoist. A monorail hoist is also provided between the engine room and the shop so that parts can be picked up from the main engine room crane and carried to a suitable location in the shop. A monorail system is also installed in the basement for servicing the garage and storage area as well as the oil filters in the basement auxiliary room. Heavy parts can be lifted from a truck bed in the garage through a hatch in the shop floor by means of the shop monorail hoist.

Fuel System

Fuel oil is delivered to the plant by truck transport and is pumped to the bulk fuel oil storage tanks. Two small transfer pumps (one for standby) pump the oil from these bulk storage tanks through a heat exchanger (heated with jacket water), then through two fuel oil filters (one can be taken out of operation for service) to a pressure header. This pressure header supplies each of the three day tanks through a meter and float controlled valve with a priming connection also being provided to the engine from the pressure source. Float switches are included in each day tank to automatically stop the pumps if no tank requires fuel, or to automatically start the pumps if any one tank requires fuel.

A means is also included for manual starting and continuous operation of the pump, if desired, in which case the pressure header automatically relieves to the pump suction for recirculation if oil requirement is less than pump capacity. This design has proven very satisfactory and has offered advantages of:

1. Continuous flow or flow most of the time, thus allowing design of the entire system for lower flow rates.

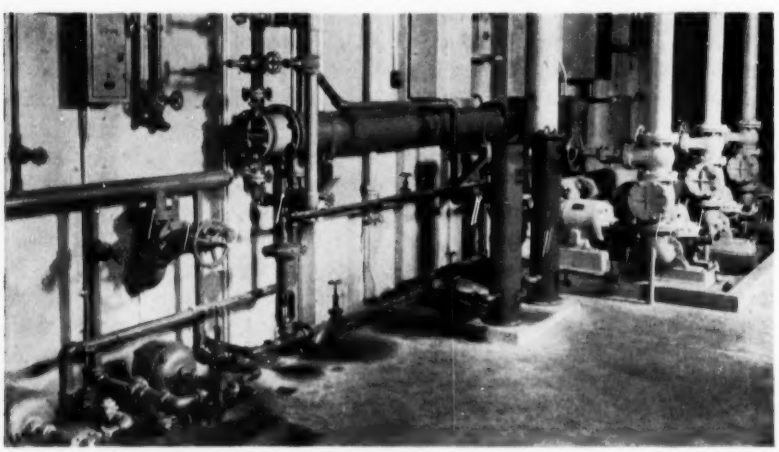
2. Smaller low capacity pumps and filters for dependability and reduces investment.

3. More satisfactory oil heating while using a smaller more economical heat exchanger.

4. Maximum convenience and dependability including the availability of a pressure source of fuel at any time and at any place in the plant.

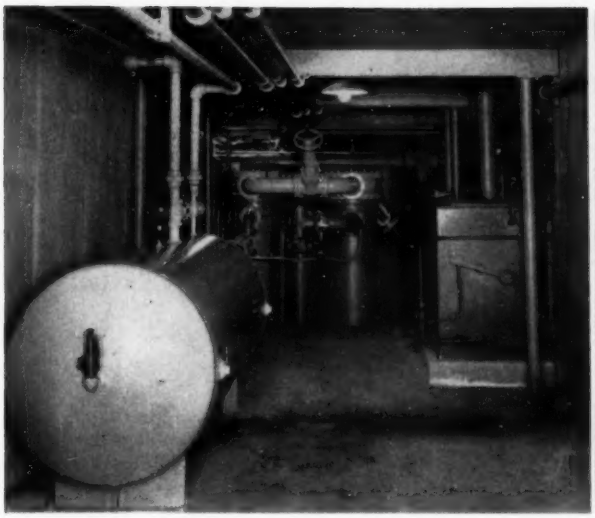
Natural gas supply to the plant was not included in the original construction, although the engines were arranged for future dual-fuel operation. Gas facilities including regulators, metering equipment and piping are now being installed.

Two fuel oil transfer pumps at left, horizontal fuel oil heat exchanger in center with two fuel oil filters in front of it, and three spray water pumps in background.

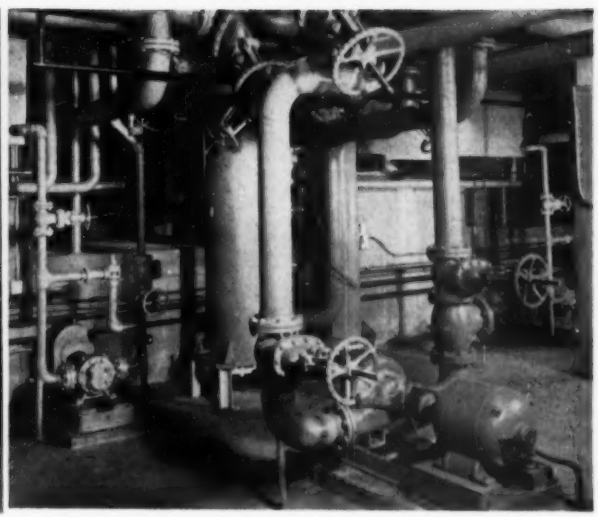


Lubrication System

The outdoor, underground lube oil storage tank receives lube oil from trucks and supplies the suction of a transfer pump which delivers lube oil to the sump tank of any engine as required. Metering equipment, valves and a level indicator for each sump tank are located at a lube oil disposing cabinet for centralized operation. Oil



Starting air tank at left, a fuel oil day tank with float controlled valve at right, and vertical lube oil and jacket water coolers in background.



Jacket water pump in foreground with lube oil cooler and jacket water cooler behind. Auxiliary lube oil pump at left connected to lube oil sump tank.

for cylinder lubricators can be drawn off at the cabinet which incorporates a drain pan, space for the dispensing cans and (on the rear of the cabinet) a log sheet shelf with rag bin below.

Each engine is provided with a main lube oil pump driven from the engine, a motor-driven auxiliary lube oil pump, a sump tank, an oil cooler, a filter pump and a continuous type oil filter. Another pump is arranged to drain any engine sump to a dirty oil storage tank and a lube oil reclaimer then reconditions this oil before returning it to the clean oil storage tank or to the engine sump tank.

Cooling System

A zeolite water softening plant treats the plant water supply which provides make-up to the jacket water system and the cooling tower spray system as well as meeting the domestic requirement of the plant.

Cooling of the engines is accomplished by means of a two-cell induced draft cooling tower with two-speed fans. Three spray water pumps circulate water from the cooling tower basin through the oil cooler and the jacket water cooler for each engine and then back to the cooling tower. The spray water system is intended to handle only the present installation and valves are included at the ends of all headers to allow future extension.

However, all new equipment for such future extension will have new circuits parallel to those now existing. This arrangement makes for more convenient and economical future extension and it avoided the extra cost of oversizing pipes and equipment in the initial installation.

While spray water uses the "header system", a somewhat unusual arrangement has been devised for the jacket water system which involves a combination of the "header system" and the "unit system". Each engine has a complete "unit" jacket water system including a jacket water pump which circulates jacket water through the jacket water cooler then through the engine and back to the pump. Headers, however, are also provided including isolating valves between all units, but these headers are sized only to carry the water requirement of one engine. This again, avoids the cost of large headers, oversized to permit future extension; it allows complete isolation of all jacket water equipment for any engine; it permits easy future extension; and convenient supply of warm jacket water is available for the fuel oil heat exchanger and for building heating even though any one engine is operating alone. In the event the jacket water pump is out of service on one engine, it is also possible to operate that engine from the system of another engine, should this be necessary.

Automatic bypass valves are included in the spray water circuit at the lubricating oil heat exchangers and in the jacket water circuit at the jacket water heat exchangers to secure automatic control of lube oil temperature and jacket water temperature.

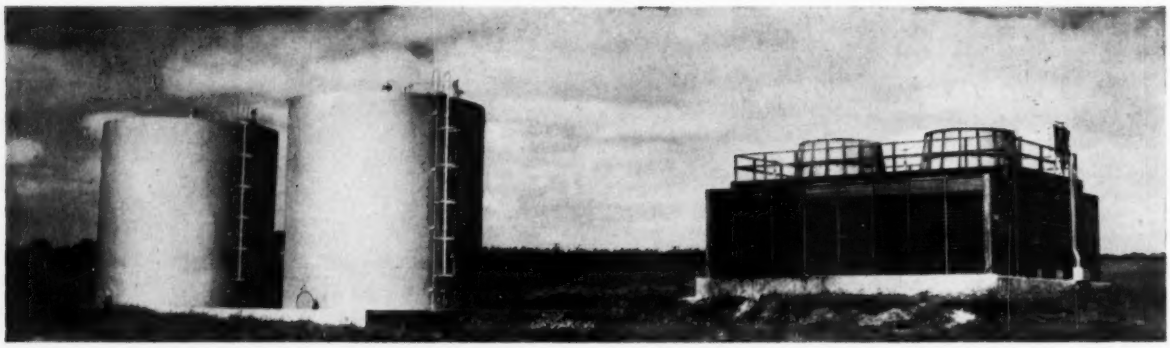
All oil coolers and jacket water coolers are mounted vertically in the basement below hatches so that tube bundles can be pulled and other service executed with the engine room crane.

Compressed Air System

A compressed air system is provided for starting of the engines and it consists essentially of two air compressors and three air tanks, one for each engine. This system maintains 250-psi. pressure and through a pressure reducing valve also supplies low pressure air for shop service, air hoses at the engines, barring gears, cleaning nozzles of air intake filters, etc.

Electrical System

Generation is at 4600 volts with all generators feeding to the indoor type ITE metal clad switchgear which supplies the outdoor substation through two feeders and the station service transformers through a third feeder. This switchgear utilizes air circuit breakers and includes complete metering and instrumentation for each circuit. A panel for instrumentation and control of the trans-



Two 50,000 gallon bulk fuel oil storage tanks and the Marley 2-cell, induced draft cooling tower.

mission lines leaving the substation is included as is a panel for totalizing plant output.

Power directional relays are included for each generator, overcurrent relays are included on each feeder and transformer differential relays are provided for each substation transformer. The switchgear includes ground detector equipment, means of checking power factor on any circuit and reclosing relays for the transmission lines leaving the substation.

A split bus is used in the indoor switchgear with all circuits except one substation feeder being connected to one side of the bus tie breaker. In this way, generators can be added to the other side of the bus tie breaker in the future without de-energizing the entire bus and it will then furnish a generating source as well as a feeder on each side of the tie breaker.

The outdoor substation is of conventional steel construction; it includes the two 500-kva. transformers, lightning arresters, and air break switches; and it supplies two outgoing transmission lines now operating 23,000-volts, but later to be changed to 34,500-volts. The substation transformers contain reduced capacity taps to permit initial operation at the lower voltage until such time as the original transmission line is converted to higher voltage construction.

Control and Safety Features

Radio communication equipment has been installed in the plant office to permit communication with the business office at Winchester, with the Winchester plant and with line service crews. In this way, control of the entire system is centered in one office, thus resulting in more flexible and improved operation throughout.

In the Pittsfield plant, special effort has been made to utilize automatic control of auxiliaries wherever possible, location and grouping of control switches or push buttons have been carefully selected and through alarm and protective features have been included to make the plant as nearly foolproof in operation as can be justified. A battery supplies a dependable source of energy for alarms and control of main circuits.

In general, auxiliary motors can be controlled from the location of the motor or from one of the control panels. Each engine is served by an engine control panel located adjacent to the controls on the engine and upon this are mounted the pressure gages, level gages, pyrometers, push button stations and alarms required for that unit. A station control panel contains pressure and temperature gages, push button stations, and alarms for those general service auxiliaries which do not associate with one specific engine. This panel centralizes the controls of the cooling tower fans and the spray water pumps and is located just off the operating aisle.

While the Pittsfield plant as yet is not fully loaded, performance has been in excess of 14 kw. hr. per gal. of fuel oil with a plant factor of 30 per cent, a load factor of 42 per cent and a running capacity factor of 82 per cent. Station service energy requirements amount to approximately 4 per cent of gross generation.

Design of the Pittsfield plant was executed by Stanley Engineering Company of Muscatine, Iowa. Much credit is due to Mr. Stanley R. Faris, general manager of the Illinois Rural Electric Company, and to Mr. Harry Collins, superintendent of generation for the Cooperative for many of the desirable features of the installation.

LIST OF PRINCIPAL EQUIPMENT

Engines	Worthington Pump & Machinery Corp.
Generator and Exciters	Elliott Co.
Battery	Gould Storage Battery Corp.
Battery Charger	General Electric Co.
Air Intake Filters	Dollinger Corp.
Exhaust Silencers	Maxim Silencer Corp.
Fuel Oil System	
Heaters	Ross Heater & Mfg. Co.
Filters	The Hilliard Corp.
Pumps	Worthington Pump & Machinery Corp.
Meters	Bowser, Inc.
Lube Oil System	
Pumps	Worthington Pump & Machinery Corp.
Filters	The Hilliard Corp.
Reclaimer	The Hilliard Corp.
Starting Air Compressor & Tank	Worthington Pump & Machinery Corp.
Cooling System	
Induced Draft Cooling Tower	The Marley Co.
Cooling Pumps	Worthington Pump & Machinery Corp.
Jacket Water Heat Exchangers	Struthers Wells Corp.
Water Treatment (Zeolite Softeners)	Graver Tank & Mfg. Co

Washington Slant

CMP REGS. 1 & 3 are now off the press. Official CMP Class B Product list, too. Many products of diesel and allied industries are listed without asterisks, indicating programming. Non-listed items are considered Class A products.

CMP Reg. 1 outlines basic rules for operation under the CMP. Controlled material requirements (steel, copper, aluminum) and production schedule should be filed as soon as possible with claimant agency (government purchaser) or NPA Division as appropriate.

FOR CLASS A PRODUCTS schedules go to claimant agency on Form CMP 4A for authorization and materials allotment, including needs of subcontractors. Allocation is to prime contractor (consumer, in NPA parlance) who breaks it down, keeping pertinent records.

SCHEDULES FOR CLASS B PRODUCTS go to appropriate NPA Division on Form CMP 4B. Include self-addressed card for receipt and give maximum pertinent information in letter of transmittal.

ALLOTMENTS, on quarterly basis, are in terms of one or more or the following: carbon steel, alloy steel, stainless steel; copper and copper-base products, brass mill products, copper-wire mill products, copper and copper-base alloy foundry products and powder; and aluminum. Identifying allotment number has agency letter symbol, digit to peg particular authorized program, and valid allotment quarter. Example: K-2-4Q51.

REG. 3 DEFINES preference status of delivery orders and explains use of DO's and allotment numbers to obtain non-controlled products and materials.

PREFERENCE STATUS OF CONTROLLED MATERIALS is as follows: (1) NPA directives; (2) Authorized CMP orders; (3) DO's calling for delivery before Oct. 1; (4) Non-rated orders. Preference status for other restricted materials follow: (1) same as above; (2) DO's with allotment symbol; (3) DO's without symbol for delivery before Oct. 1. (After this date, have equal preference with DO's bearing allotment numbers); (4) Non-rated orders.

DIESEL MANUFACTURERS COMMITTEE met with NPA's Engine and Turbine Division and were informed of plans to delegate authority to the office of International Trade to assign DO-97 ratings to export shipments of MRO supplies. Necessary to keep defense and essential civilian equipment going in countries outside Soviet bloc.

OTHER DEVELOPMENTS were that Defense Minerals Administration has provided a system to determine diesel requirements for mining on basis of defense essentiality. Also, Order M-44 (heavy power equipment) may be amended so that certification of "end use" accompanies material requests.

INTEGRATED MANUFACTURERS building own components may elect to stay under CMP or get materials on free market. NPA will aid manufacture of components so that fluctuating military needs can be met.

COMPLAINT ON CERTAIN SPECIFICATIONS was registered by committee members; claim them outmoded or too rigid. Result is wasted man-hours and excessive use of critical materials. Engine builders are to inform proper NPA Divisions, then study with military agency concerned.

LOCOMOTIVE BUILDERS COMMITTEE, meeting for first time, expresses accord with NPA's conservation program calling for maximum saving of critical materail and development of standardized parts.

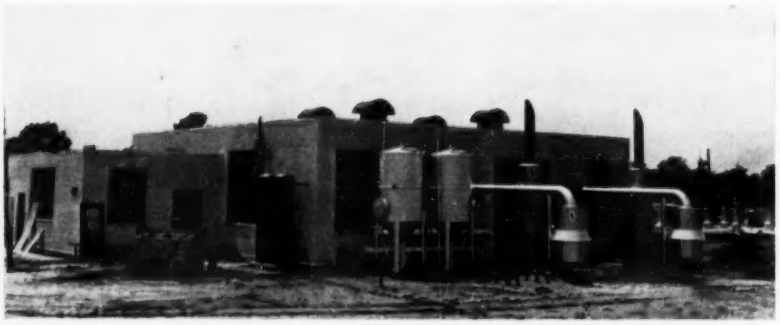
REG. 4 (MRO) does not follow established railway accounting practices required by ICC, members pointed out. NPA is now reviewing. Steel and high grade bronze shortage is laying up steam locomotives, needed in spite of high diesel locomotive production. Increased MRO is being granted as interim relief pending effective date of CMP, July 1. Industrial locomotives were cited in short supply. All agreed that plate steel production must be upped and locomotive builders were urged to get minimum of 15 per cent of tonnage from strip mills.

INTERNAL COMBUSTION ENGINE COMMITTEE (over 750 rpm., excluding aircraft) had about the same story. Steel and iron, now on low inventory, may force production curtailment. Copper and zinc, components like starters, generators and bearings are also in short supply.

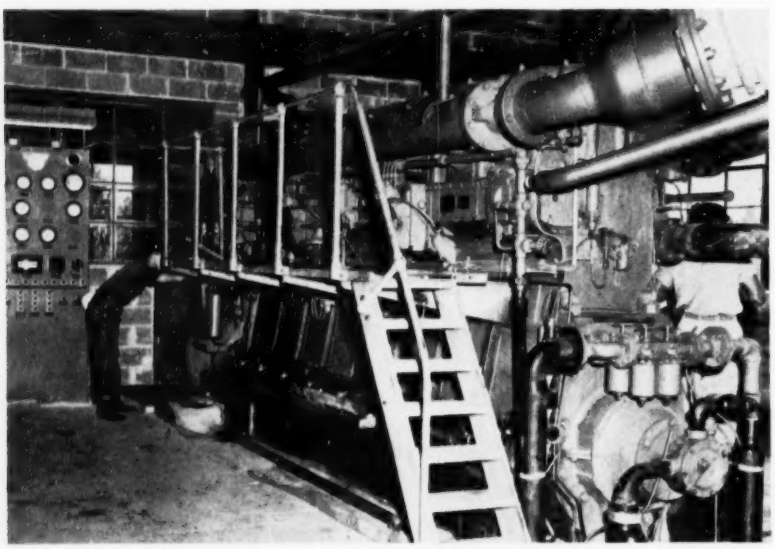
MORE STEEL PRODUCTS may be available before CMP, according to NPA, for such vital production. Committee stressed importance of additional materials for purpose of keeping skilled labor forces intact.

Mid-Valley Pipeline Boosts Capacity with Additional Pumping Power

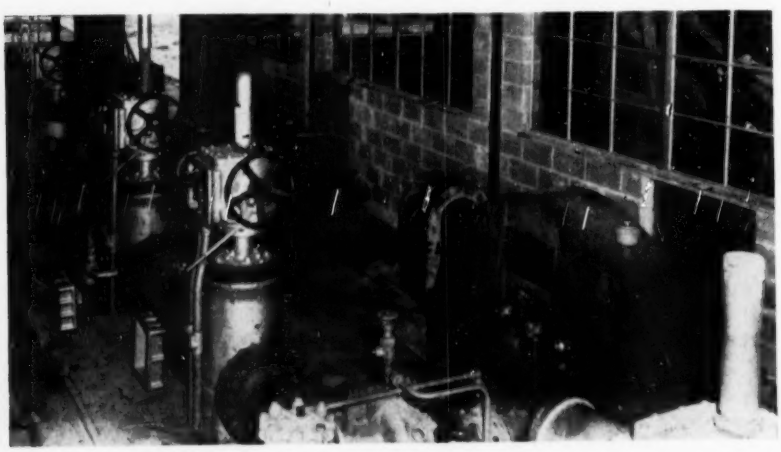
by Milo D. Pugh



A pumping station along the Mid-Valley Pipeline.



Above—One of the Cooper-Bessemer engines before supercharging. Below—Pump room with speed increasers and pumps in a Mid-Valley station.



Extending from Longview, Texas to Lima, Ohio, the new 1000-mile Mid-Valley pipeline that went into service last year is to be stepped up in capacity. This is to be accomplished by the enlargement of present pumping stations and the addition of some new ones. This will result in higher pressures and thus a higher rate of flow through the present line.

The line was built and will be operated by the Mid-Valley Pipeline Company with offices in Longview, Texas. Although a separate, integrated organization, this company—and the pipeline — is jointly owned by the Sun Oil Company and the Standard Oil Company of Ohio. The line was built for the purpose of keeping pace with the petroleum demands of the general Ohio area.

Tremendous expansion in the refinery capacity of these organizations has taken place and is under way and it follows that a cheap and efficient means of transporting the crude charging stock was an essential parallel project. The system is one of the newest and longest underground steel crude oil pipelines and has cost approximately $56,000,000 to date.

After careful study the route shown in the accompanying map was selected and the necessary engineering work undertaken. A profile of the line was developed for the hydraulic studies, telescoping arrangements, and pump station spacing. The bulk of the line was of 22-in. diameter pipe, the balance being 20-in., all with a yield strength of over 50,000 psi. Partial operation began in 1950, completed sections such as the 120-mile stretch from Haynesville, La., to Mayersville, Miss., and the 120-mile section of 20-in. pipe between Cincinnati and Lima, both in Ohio, being immediately put to use.

After arriving at the best station spacing and the necessary design criteria, power sources for the pumping

stations were selected. Governing factors were economy with respect to immediate expenditures and operation. Diesel operation was possible by using crude oil from the line and where there was a nearby source of low cost gas, gas-diesels could be used. Low electric power rates in the TVA area made this form of power attractive. Thus, all three forms of power were used.

Originally there were four gas-diesel engine and three electric powered pumping stations. The current program calls for three additional gas-diesel and one diesel station as well as two more electric powered pumping stations.

Present gas-diesel stations, operating on gas with crude oil as pilot fuel, are at Longview, Texas and Haynesville, La.; Clarkson, Ky. and Hebron, Ky. operate on the diesel cycle using crude oil for fuel. The term "gas-diesel" is used, but actually the injection pumps on the Cooper-Bessemer engines used in all of these stations are of sufficient size to handle full load operation on oil. Hence, they are actually dual-fuel engines.

Those installed at the first two locations mentioned are Cooper's model JS-8-GDT engines. They are 8-cyl. units with a bore of 13 inches and a 16-in. stroke. Original rating was 800 hp. at 450 rpm., but this is being boosted to 1200 hp. by turbocharging. Two engines were installed in each and a third is being added, giving a total of 3600 hp. per station.

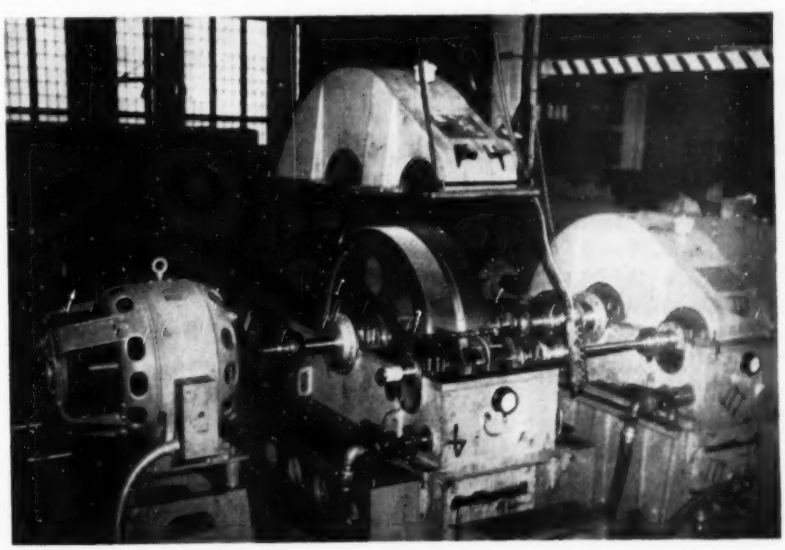
A similar program exists at the Clarkson and Hebron stations where, in each, two model LS-8-GDT Cooper-Bessemer engines were installed and a third is being added. These are 8-cyl. units, 15½-in. by 22-in., with a turbocharged rating of 1715 hp. at 327 rpm.

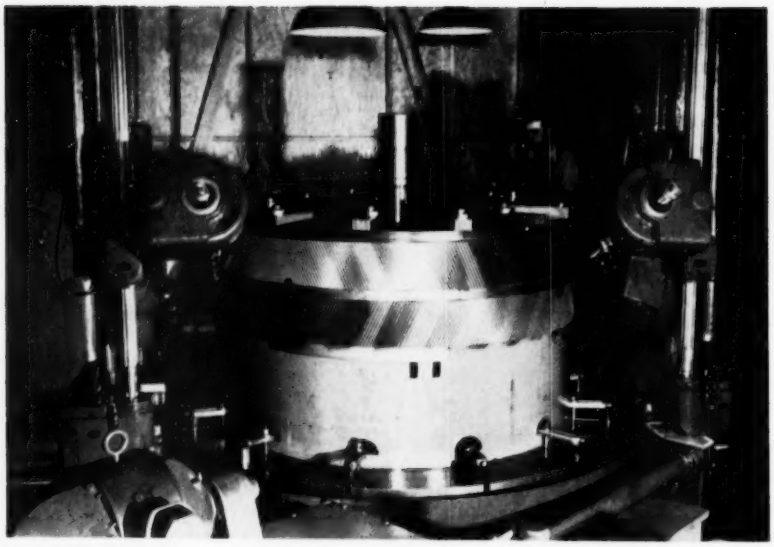
New engine powered pumping stations are being added at Stevenson, Miss., Minter City, Miss., Simsonville. Ky., and Pyrmont, Ohio. There will be three JS-8-GDT units, installed at the first location, three LS-8-GDT units at each of the next two, and three LS-8-T supercharged diesels at the Ohio station. All except the latter will operate as gas-diesels.

Natural gas for the gas-diesel opera-

Above—Route of the Mid-Valley Pipeline.

Below—One of the speed increasers with the cover removed.





One of the large herringbone gears for a 1700 hp. unit being hobbed on a 120 inch hobber. Gears are hobbed in a temperature controlled room.

tion is drawn from the gas pipelines of the Texas Gas Transmission Corp. and the Tennessee Gas Transmission Corp., where their proximity makes it practical. Should the gas supply fail for any reason, fuel oil bled directly from the Mid-Valley pipeline will be used, thus assuring maximum operational flexibility and uninterrupted service as the engines are arranged to burn all crude oil or any combination of gas and oil down to the lowest limit of pilot oil necessary for ignition.

General Electric 3600-rpm., 2300-volt, 1500-hp. motors of the base ventilated type are used in the electric stations. There are two units in each station and provisions for a third should it prove desirable. Ventilating fans, mounted over the control room, force the cooling air through floor ducts. Discharge is to the atmosphere. There are stations at Mayersville, Miss., Abbeville, Miss., and Elkton, Ky. Additional stations are planned at Hornsby and Denver in Tennessee.

While the speed of the electric motors is suitable for the direct operation of the Byron-Jackson centrifugal pumps at their operating speed of 3600 rpm., speed increasers are necessary in the case of the engine powered stations.

A step-up of the 450-rpm. engine speed with a ratio of 1 to 8 and the 327-rpm. engine speed with a ratio of 1 to 11 is accomplished by Western Gear speed increasers through Thomas flexible couplings between the engines and the speed increasers and Waldron flexible couplings between the increasers and the pumps.

These speed increasers are said to be the largest ever used in a pipeline in the United States. They were designed and built by Western Gear Works, Lynwood, California. They have fabricated steel cases of double wall, drop center type to maintain rigid support of the bearings. The main bull gear of the herringbone type was fabricated with an SAE 4130 forged alloy steel rim, 83-in. OD by 76-in. ID by a 21-in. face. The forged steel shaft has a $\frac{3}{4}$-in. thick webbing connecting the rim and hub. All the gear weldings were carefully preheated before welding and stress relieved after welding. The gear rim was annealed before rough machining and heat treated to 100,000 psi.

The mating pinion was forged from SAE 4340 alloy steel and heat treated to 130,000 psi. A specially built lathe capable of holding extremely close tolerances performed all finish machining operations. The journal finishes were particularly critical and roundness of the journal was held to 0.0002 in. The runout of the face from the journals was held to 0.0005 in. Special alloy bronze-backed sleeve bearings with extremely fine finish were used.

The gear teeth were rough and finish hobbed on two giant 120-in. hobbing machines which are among the few of this type in use in America. This hobbing is done in a controlled temperature room which is held to as close as 3° F. Before any machining was done, the gear rings were set up ready for cutting and allowed to stay idle for five days while the temperature stabilized to prevent any variations in the cutting accuracies. After the gear cutting operation, the teeth of the gears were lapped with both high and low pressure laps to correct any tooth inaccuracies that might have occurred.

The bearings used for supporting the gears in the housing are bronze backed, babbitt lined and have split housings bolted to the lower half of the gear case. These housings are easily removable for replacement or servicing of the bearings. In operation these are pressure lubricated and the oil is cooled in water cooled heat exchangers.

The gear units were assembled on test stands with complete piping installed and test run under full speed and torque loads. Careful checks were made periodically during the test by means of thermocouples and pyrometer to determine the temperature of the bearings, sump oil and the case. Sound levels, tooth contact pattern and the efficiency of the units as a whole were carefully checked before being released for shipment.

Bryon-Jackson centrifugal pumps are used in all of the pumping stations. Those at Longview and Haynesville are 12-in single stage units and those at the other original stations are 12-in. two-stage units. The single stage pumps are considered adequate even with the expanded capacity, but the others are to be replaced and, of course, those in the new stations will be sized on the basis of the ultimate capacity of the line.

Standardized designs were developed for both the electric and engine powered stations, using concrete blocks as the basis for construction. Protection is afforded against fire hazard by the use of a "foamite" type system includ-

ing a permanent sprinkler network and manually operated foamite nozzles at strategic locations. Portable extinguishers round out this type of equipment.

Control of all station functions is centralized and made automatic insofar as possible. Control rooms are on raised platforms with the control desk facing a window overlooking the engine and pump room. Station piping including valves, tanks, pumps, etc., are represented diagrammatically on the desk. Valve position is indicated visually and illuminated arrows show the flow pattern through the station. Warning lamps advise of the presence of unusual conditions such as abnormal pressure and flow fluctuations, high bearing pressures, low air pressure, etc.

Line discharge and suction pressures are automatically controlled in the engine powered stations by varying engine speed. Selectors that are sensitive to the pressures on each side of the pumps are tied in directly to the engine governors and suitably adjust the speed. In the case of the electric stations, throttling valves are automatically positioned by a similar selector to control pressures.

Throttling or slow-down that might result if different types of crude were being pumped by successive stations is avoided by the use of booster pumps at each station. These are arranged to inject from the tank storage the necessary make-up into the main line stream.

Overall control of the pipeline is facilitated by the use of microwave radio relay system. Installed at an initial cost approximating $750,000, it is felt that the investment was worthwhile and would pay for itself through savings in operating costs and greater operating efficiency.

The original through put of approximately 157,000 bbl. of crude per day is an important contribution in meeting the surging petroleum product requirements of Ohio and adjoining areas. Much of this demand is tied in with defense production speed-up. By the addition of more power the through put is expected to reach 235,000 bbl. per day and hence further contribute to this vital work.

Asme Oil & Gas Power Conference

THE Oil and Gas Power Division of the American Society of Mechanical Engineers will hold their 23rd Annual Conference and Exhibit at the Baker Hotel in Dallas, Texas, from June 25 to 29, 1951.

Papers on subjects of interest will be presented on Monday, Wednesday and Thursday. A panel discussion will be held all day Wednesday with the audience participating on questions and answers that arise from subject matter presented at that time. The special lecture series of the OGP will be held Tuesday. Friday has been set aside for inspection trips.

Registration will take place Monday morning followed by a short Technical Session. The subject of the paper to be presented is "The Effect of Charge Temperature and Pressure on Rating of Diesel Engines and a Variable Compression Ratio Supercharging System for 2- and 4-Cycle Internal Combustion Engines", and will be presented by Ralph Miller of the Nordberg Mfg. Co.

Two papers, one by A. C. Cavilleer, U. S. Naval Engineering Experiment Station, Annapolis, Md., on "Damage Prevention from Diesel Engine Crankcase Explosion" and another by G. W. Ferguson of the Texas Company on "Diesel Engine Crankcase Explosion Investigation", will comprise the afternoon Technical Session.

The first of the OGP Special Lecture Series on Tuesday morning will be given by G. Forrest Drake, of the Woodward Governor Company, who will discuss the basic requirements of "Internal Combustion Engine Governing". The afternoon lecture will deal with governing problems entailed in the "Parallel Operation of Generating Sets", and will be presented by Charles Concordia of G-E.

Wednesday morning's Panel Discussion will be on the subject of "Engine Operation and Maintenance from the Operator's Viewpoint". Topics to be discussed at this time will be: "Municipal Plant Operation", by Patrick Schlesinger of the Ponca City Municipal Water and Light Company; "Fuel Preparation" by D. E. White of the Magnolia Pipe Line Company; "Water Treating Problems" by O. H. Moore of the Tennessee Transmission Company; and "Maintenance Procedures" by W. A. Rachuig, Humble Pipe Line Co.

The afternoon panel session will cover the other side of the story and take up "Engine Operation and Maintenance from the Manufacturers' Viewpoint". Topics presented for discussion at this time are: "Four Cycle Engines", by R. L. Boyer of the Cooper-Bessemer Corporation; "Two Cycle Engines" to be given by Robert Cramer of the Nordberg Manufacturing Company; "Fuel Injection Equipment" by Hans Hogeman of the American Bosch Corporation; "Governors" by G. Forrest Drake of the Woodward Governor Company; and "Pistons and Rings", by H. G. Braendel, Wilkening Mfg. Co.

Thursday morning, two papers will be presented, one, "The Modern Gas Engine", by R. L. Boyer of the Cooper-Bessemer Corporation and the other, "Operation of a Direct Connected Engine Driven Compressor as a Gas Generator" by Messrs. Mackendrick, Bollman, and Chamberlain, all of Clark Brothers Company.

Friday will be devoted to inspection trips. Of major interest, is the all-day excursion to visit the Halliburton Cement plant at Corpus Christi, Texas, where diesel power plays a major role in the conversion of oyster shells into cement, and a visit to the largest internal combustion plant in the world, Alcoa's Point Comfort plant for the electrolytic reduction of ore to make aluminum. Planes have been chartered so that the considerable distances can be covered in a single day.

As an alternative and shorter trip, arrangements have been made to visit the Magnolia Field Research Laboratory in Dallas.

As in other years an exhibit will be a feature of the Conference. It will be open all day throughout the Conference. The exhibit has promoted better relations between manufacturer and customer, and results in a more closely knit industry.

Entertainment has not been overlooked and there is a luncheon, banquet, and barbecue planned.

DIESEL BRIEFS

Diesel Tractor for Airport

At Dorval Airport, Quebec, Canada, British Overseas Airways Corporation employed a Caterpillar DW10 rubber-tired tractor to haul its big 77-ton Boeing Stratocruisers from taxi strip to hangar. The DW10 is equipped with Fruehauf electric sanders to supply sand to the rear wheels on ice conditions. Additional attachments include a counterweight box and Hyster Hy-Speed Winch. All four tires are filled with 100 per cent calcium chloride solution.

Total weight of DW10 is 35,930 lbs., of which 27,640 lbs. is on the rear wheels. The unit has a draw bar pull of approximately 22,000 lbs. on dry concrete.

Worthington Engine Installed

A new high compression spark ignition gas engine has just been shipped to Arizona Edison Company, Inc. at Ajo Heights, Arizona, by Worthington Pump and Machinery Corporation. This new type of gas engine with diesel compression is the first of its kind to be installed in Southwestern United States.

Preparing for additional customer demand in the future, Arizona Edison specified a 4-cycle engine suitable for 50 per cent increase in power by supercharging at a future date. The present generator and engine auxiliaries are suitable for the ultimate power—720 hp. sea level rating. This high compression type engine is said to use 27 per cent less fuel than the conventional type of spark ignition gas engines.

Canadian Pacific Dieselization

The Canadian Pacific Railway has approved the Calgary-Revelstoke dieselization program for the present year.

Late summer has been tentatively set for delivery of 28 road units of diesel power which will be the first instalment of the power needed to completely dieselize the mountain territory for freight service. Construction is being rushed on a diesel shop at Alyth to service all such power west of Calgary and an extensive program of lengthening passing tracks is planned.

Mexico Purchases Diesel Locomotives

Mexico has recently acquired 70 diesel locomotives from the United States—8 for service work in stations and 72 for the passenger and freight service of National Railroads of Mexico.

The expenditure of fourteen million dollars ($200,000 for each locomotive) is considered to be a wise investment. One of the officials of the railroad stated that this acquisition will give adequate coverage for the country and further facilitate movement of freight with shipments constantly on the increase.

Static Friction Tests

Static friction tests of a number of relatively new special lubricants, in combination with various metals, have recently been completed at the National Bureau of Standards. Selection of a lubricant for a particular special application was the immediate goal of the investigations, which were sponsored by the Naval Ordnance Laboratory and conducted by H. S. White of the NBS engines and lubrication section. Although lubricant information was the primary concern of the tests, the effect of metal composition and of metal surface finish on static friction was also investigated.

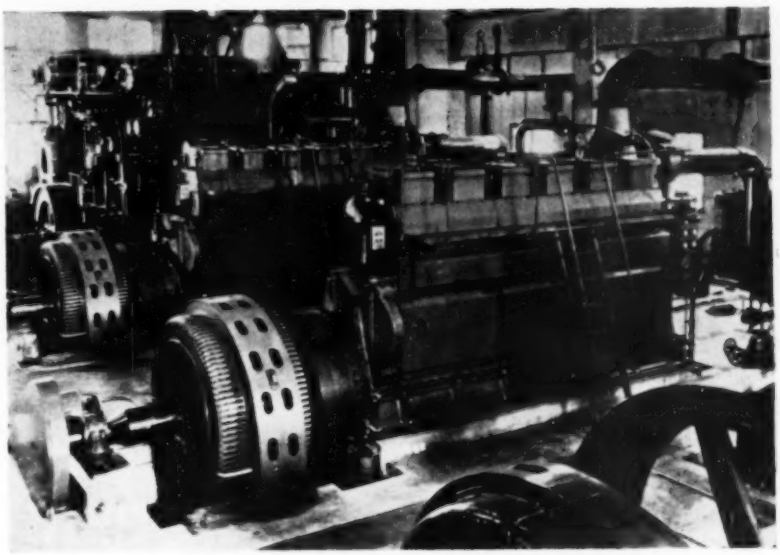
Some twenty special lubricants, principally chlorinated and fluorinated hydrocarbons with and without various additives, were tested. Additives investigated included graphite, molybdenum disulfide, zinc oxide, boron nitride, and an oxidized petroleum compound. An SAE 10 mineral lubricating oil (Navy symbol 2100) was used as a reference or basis of comparison. Metal surfaces used in various combinations for the tests were stainless steel, carbon steel, cast iron, aluminum alloy, and chromium plate. An inclined plane test apparatus of conventional design was used.

DIESEL BRIEFS

GMC Swing Toward Diesel

The trend in the trucking industry toward the use of diesel-powered trucks is continuing at a rapid pace in 1951 and the future heavy duty field looks predominantly diesel. H. B. Ford of the General Motors Corporation Truck and Coach Division told a meeting of the Northern California section, Society of Automotive Engineers, recently held in Pontiac, Michigan.

Ford pointed out that the swing toward diesel is contrasted against sales in 1938, when diesel truck sales totaled only 489, edged up to almost 2000 in 1946, then reached 12,669 in 1950.



Worthington Diesels in Tangier

To provide for municipal water supply and industrial and residential power and light for a 100,000 population which Tangier, North Africa expects by 1956, Worthington Pump and Machinery Corporation has provided two 1370-hp. diesel generator sets with SEH-6 engines and electric machinery generators. The two new diesel generators, each rated at 950 kw. will also normalize the utility services for the zone's present 75,000 inhabitants.

The present power plant in this Mediterranean port is equipped with two Italian made engine generators; one 2200-hp. and the other 1700-hp., which together with the two new units will work in parallel. The new units replace one 1000-hp. and two 500-hp. engine generators.

"Cat" Exhibits in India

At the recent opening of the Exhibition and World Power Conference, sponsored by the Central Board of Irrigation, Government of India, a display was set up by Tractor & Equipment Corporation, Ltd., Caterpillar Tractor Co. dealer in New Delhi, India, who participated in the exhibition on behalf of all dealers in India.

A. E. R. A. Convention

There was a registration of approximately one thousand at the 29th Annual Convention of the Automotive Engine Rebuilders Association at the Hotel Sherman in Chicago.

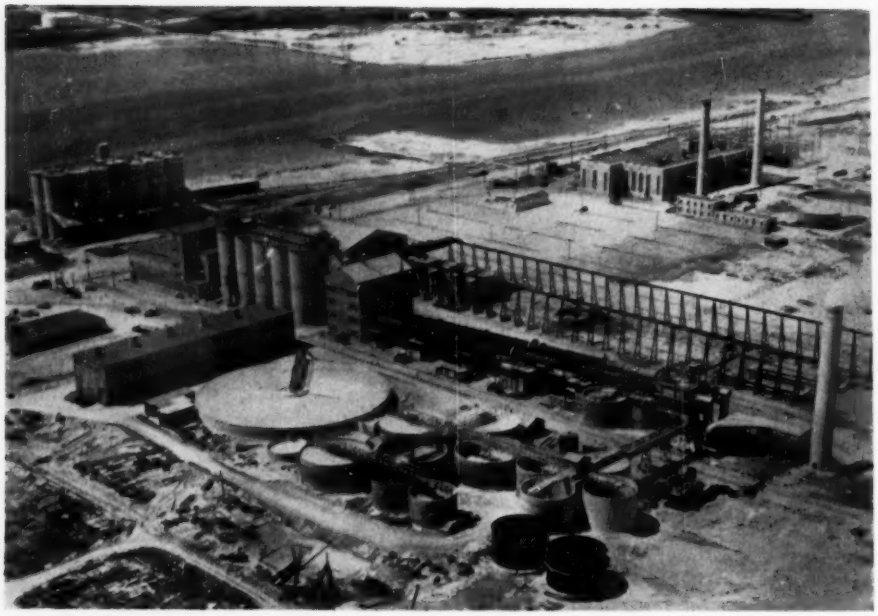
The welcoming address was given by James H. Templin, Motor Car Supply Co. of Chicago. Practical advertising programs, brake bonding, shop catalogs, engine cleaning, sleeve installation, magna-fluxing, hard chrome crankshaft bearings, conversion of engines to liquid petroleum gas, diesel maintenance service, cold welding, run-in-equipment, and associated activities were the subjects discussed.

Booths were set up in the grand ballroom and exhibition room of the Sherman for eighty manufacturers, suppliers of automotive replacement parts, machine shop equipment and related products. Conference periods were planned in connection with the program.

Applied Mechanics Congress

The first National Congress of Applied Mechanics was held on June 11 to 16 at Illinois Institute of Technology. There were five general lectures, and 138 technical papers presented in 27 sessions on various phases of applied mechanics. Among the subjects discussed were friction, failure of material, theoretical and photoelastic stress analysis, plasticity, heat transfer, fluid flow, elasticity, dynamics, aeroelasticity, and vibration.

The Congress is under the sponsorship of the U. S. National Committee of Theoretical and Applied Mechanics, a joint committee of the American Society of Mechanical Engineers, American Institute of Chemical Engineers, Society for Experimental Stress Analysis, American Society of Civil Engineers, Institute of Aeronautical Sciences, American Mathematical Society, and the American Physical Society.



With a capacity of 1,500,000 bbl. of Portland cement a year, the new Halliburton plant finds it profitable to produce its own power despite adjacent utility steam plant (right).

Halliburton Cement Plant Powered By Four Dual-Fuel Engines

FOUR dual-fuel engines are meeting a difficult dual challenge in the big new plant of the Halliburton Portland Cement Company at Corpus Christi, Texas. First, there is the economic challenge; a big modern utility steam plant is located just a few yards away and engine operating costs must compare favorably with the cost of purchased power. Second, there is the operating challenge; the big ball grinding mills and other processing equipment are always a taxing load and sometimes a staggering load.

Rounding out their first year of service, the engines have met both these challenges with unqualified success. First, vice-president Ellroy King reports that it has been profitable to operate dual-fuel engines. Second, the plant has not experienced a single shut-down due to engine failure.

All four engines are 2-cycle, Fairbanks-Morse dual-fuels of 16-in. bore and 20-in. stroke, developing rated horsepower at 300 rpm. Two of the prime movers are 10-cyl. units rated at 2000 hp. and two are 8-cyl. engines rated at 1600 hp. The larger engines drive 1400-kw., 4160-volt Fairbanks-Morse alternators; the smaller engines turn 1125-kw. F-M alternators.

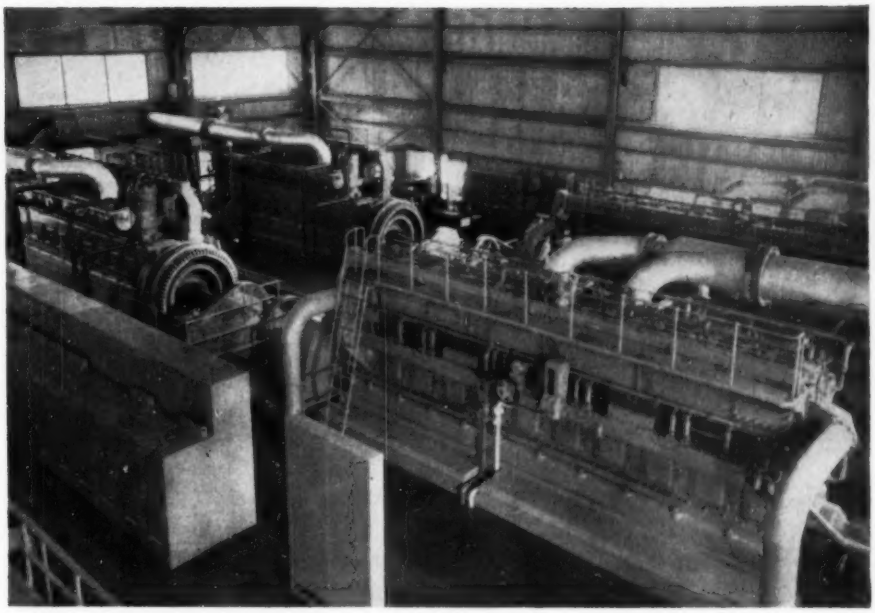
The multi-million-dollar Halliburton mill has a capacity of 1,500,000 bbl. of portland cement a year and incorporates many unique design features. Though not the first to make cement from oyster shells, this is the first cement mill to grind oyster shell in closed circuit with rake and bowl-type classifiers. All raw materials—shell, clay, and bauxite and iron ore—are ground separately and stored as slurry in individual tanks to permit maximum flexibility in blending the product.

Another unusual feature is the provision of duplicate equipment which not only insures continuity of production, but makes it possible to operate two complete circuits independently. Thus, the plant can run at half capacity or produce two different cements simultaneously.

Cement manufacture requires heavy, power-consuming equipment. The two primary grinders are 8 by 16-ft. Allis-Chalmers ball mills driven by 450-hp. Electric Machinery synchronous motors. A secondary mill for shell grinding takes another 450-hp. motor. G.E. 100-hp. motors turn the two 337-ft. kilns and each kiln has two induced draft fans driven by 100-hp. motors. Clinker is ground into cement in two 7 by 40-ft. Allis Chalmers 3-compartment balls mills driven by 700-hp. Electric Machinery synchronous motors. Cement is pumped to storage by two pumps driven by 150-hp. EM motors and the pumps are served by two rotary compressors driven by 200-hp. motors.

This obviously is but a fragmentary list of equipment. In all, it takes 5600-hp. to operate the plant at capacity, a load which can be carried by three engines with one 1600-hp. unit in reserve. It is the practice in this plant to run engines at full load. Units in operation must run at an overload before the operator starts up another engine.

Even the 5600-hp. requirement,



Four F-M engines are producing power at a rate of 25 million kw. hr. a year. There have been no engine failures since the start of operations even though loads are staggering.

however, is not the full story on power demand. Pieces of heavy machinery stop and start and the starts take lots of power. For example, the mills that grind clinker into cement each hold about 6500 lb. of 3½-in. balls 14,600 lb. of 3-in. balls and 14,000 lb. of 2-in. balls in the first compartment; 44,500 lb. of 1¼-in. balls in the second compartment; and 61,800 lb. of ⅞-in. Concavex media in the third compartment. There are no clutches and the 700-hp. electric motor is started across the line, pulling an estimated 500 per cent overload. Works manager, A. J. Anderson reports that the big mill is usually started when the engines in operation are already fully loaded, yet they take the sudden surge of demand in stride.

This was one of the factors which influenced Halliburton to put in its own power plant, since the power company took a dim view of starting the big motors across the line. Economy was another big factor. Demand charges for purchased power were bound to be high. Initially, it would be necessary to construct a big substation. Finally, natural gas is cheap in Texas and dual-fuel engines promised to generate power at competitive costs.

The four-engine plant first went into service in December, 1949, and reached full production in 1950, producing at the rate of 25,000,000 kw. hr. a year. The first six months for which complete operating figures are available are reported in Table I.

In that six-month period from July through December, 1950, the plant generated 12,775,700 kw. hr. while consuming 139,977 mcf. of natural gas and 94,227 gal. of fuel oil. This represents an average consumption of 10.96 cu. ft. of gas per kw. hr. Pilot fuel supplied 7 per cent of the Btu's. The four units ran a combined total of 13,896 hours out of a possible 17,520. During this time, lubricating oil consumption totaled 5422 gal., an average of 4601 hp. hr. per gal.

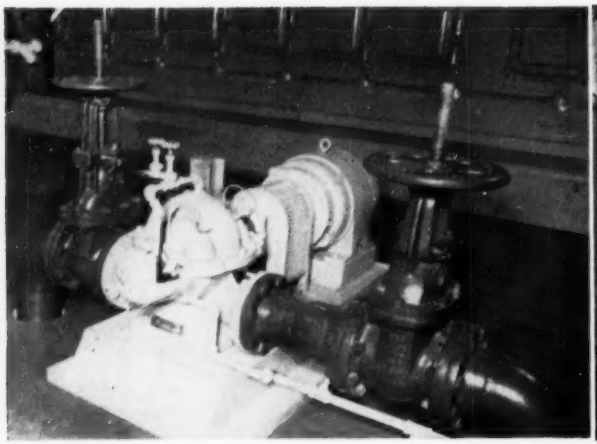
The engines can operate either as full diesels or on natural gas with oil as pilot fuel, and can be switched instantly from one fuel to the other. There have been several occasions when the gas supply failed and the engines automatically switched to fuel oil while running at full load.

Gas reaches the plant at 50 to 60-lb. pressure, is regulated to 56 lb. by an orifice fitting, is metered, and then reduced to 17 lb. in individual regulators for each engine. Fuel oil flows by gravity from storage to four 600-gal. day tanks. Picked up by engine-driven supply pumps, the fuel is pumped through duplex filters to the special small-capacity injection pumps that handle the pilot oil.

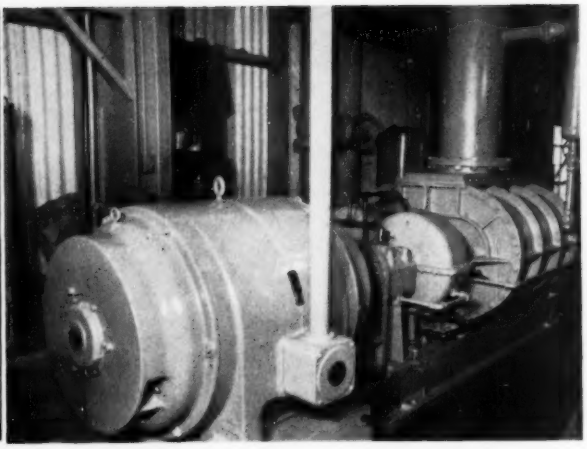
A straight mineral oil is used to lubricate the engines and cool the

PRINCIPAL POWER PLANT EQUIPMENT

Engines	Fairbanks, Morse & Co.
Generators	Fairbanks, Morse & Co.
Blowers	Roots-Connersville Blower Corp.
Air Filters	Air-Maze Corp.
Exhaust Silencers	Maxim Silencer Co.
Lube Oil	Gulf Oil Corp.
Lube Oil Purifiers	Honan-Crane Corp.
Oil Coolers	Ross Heater Mfg. Co.
Auxiliary Lube Pumps	Roper Corp.
Fuel Filters	Nugent & Co., Inc.
Gas Regulators	Fisher & Porter Co.
Heat Exchangers	Ross Heater Mfg. Co.
Cooling Water Pumps	Fairbanks, Morse & Co.
Water Softener	Fairbanks, Morse & Co.
Exhaust Pyrometers	Illinois Test & Laboratories Co.
Levelmeters	Levelometer Corp.
Switchboard	I. T. E. Circuit Breaker Co.
Switchboard Instruments	General Electric Co.
Air Compressors	Gardner - Denver Co.
Standby Diesel	Fairbanks, Morse & Co.



Jacket water for each engine is supplied by a motor-driven F-M centrifugal pump.



Separate Roots-Connersville scavenging air blowers are used with the 2000-hp. engines.

pistons. Oil is circulated under pressure by built-in engine-driven pumps to the bearings and pistons and through a shell-and-tube oil cooler. Part of the oil is drawn from the crankcase continuously and put through a Fuller's earth purifier for each engine. Upper cylinders are supplied with lube by force-feed mechanical lubricators which are filled automatically from the crankcase oil supply. Each engine has a motor-driven auxiliary lube pump for use in starting and shutting down.

Each engine has a separate closed cooling water system with a motor-driven centrifugal pump circulating soft water through the engine jackets and a shell-and-tube heat exchanger. Jacket makeup water is treated in a zeolite softener. Nueces Bay, which adjoins the plant, provides an abundant supply of salt water for the raw circuit. The salt water is taken from the bay by three vertical turbine pumps, put through the exchangers and discharged to the bay. Jacket temperature is regulated by automatic thermostatic controls which bypass soft water around the exchangers.

The 1600-hp. units have built-in scavenging pumps. The 2000-hp. engines are supplied with scavenging air by motor-driven rotary positive blowers. Air for each engine is drawn from outside the building through 16-element impingement-type filters in metal air houses. Exhaust gases vent through vertical silencers. Starting air is provided by a pair of motor-driven compressors which keep four bottles at 250-psi.

The power plant's main switchboard is of the all-enclosed, dead-front, unit type with electrically-operated switchgear and particularly complete instrumentation. There is also a gauge panel beside each engine with an exhaust pyrometer, day tank level meter, gauges and alarms on lube and water pressure, and switches for engine auxiliaries.

One piece of equipment that already has earned many times its price is a 6-cyl. Fairbanks-Morse diesel which turns an Electric Machinery synchronous generator at 1200 rpm. to develop 30 kw. The most crucial piece of production machinery in the mill is the thickener on which the entire plant depends. The thickener must run constantly and, if power failure caused it to stop, the mill might be shut down for a prolonged period.

To insure an unfailing power supply, plant designers provided three alternate sources: a special line to the nearby utility plant, the mill's own 4-engine power plant, and finally the little diesel-generator set. If one source fails, an automatic device switches the thickener motor to the next source, and then, if necessary, to the third. On one occasion, lightning knocked out the transformers of both the utility and the big dual-fuels and it was the 30-kw. generator that kept the thickener going.

This standby service is most important, but the little diesel has other functions. It provides enough power to light the entire mill and operate starting air compressors and other engine auxiliaries when all the big engines are shut down.

There is evidence throughout the mill of Halliburton's determination to manufacture a fine product with maximum efficiency. In the power plant this is evidenced by the heavy-duty prime movers and their full complement of protective and accessory equipment. Power plant superintendent Herbert Bolt is doing his share through a preventive maintenance program, designed to keep the engines in peak condition. In the first year, no repairs were necessary.

TABLE I summarizes operating figures for the first six month period for which complete figures are available.

1950	Kw. Hr. Generated	Gas, MCF	Cu. Ft. Gas Per Kw. Hr	Fuel Oil Gal.	Engine Hours #1 7000 Hp.	#2 1600 Hp.	#3 2000 Hp.	#4 1600 Hp.	Lube Oil, Gal.	Hp. Hrs. Per Gal. Lube
July	2,305,100	25,505	11.06	15,489	682	597	606	530	984	4,450
Aug.	1,931,300	21,814	11.29	13,235	560	503	503	558	831	4,613
Sept.	2,116,900	22,507	10.63	15,698	613	539	612	595	891	4,709
Oct.	2,174,900	23,769	10.92	15,300	607	576	577	587	894	4,741
Nov.	1,913,800	21,225	11.09	15,909	538	578	449	584	931	4,117
Dec.	2,333,800	25,157	10.73	18,596	666	517	656	615	891	5,000
Total	12,775,700	139,977	10.96	94,227	3,674	3,310	3,433	3,399	5,422	4,601

C. A. V.—Ricardo "Pintaux" Nozzle

A RECENT development of a new type of nozzle to aid in cold starting of engines using the Ricardo "Comet" type of cylinder head has been announced by C.A.V. Limited of England. The nozzle design is covered by C.A.V.—Ricardo patents.

The Ricardo "Comet" cylinder head is characterized by a partially separate spherical combustion chamber communicating with the cylinder by means of a tangential passage or throat. On the compression stroke of the engine air is forced from the cylinder, through the throat into the spherical chamber, where a rotary swirl is established. The fuel is sprayed into this swirl and complete mixing of the fuel and air, to obtain good combustion, is ensured.

To facilitate easy cold starting of engines using this type of head, it has been the practice in the past to fit a heater plug into the spherical chamber, or a heater element in air intake piping to enable the compressed air to be heated to the fuel ignition temperature.

The "Pintaux" nozzle has been developed primarily to enable easy cold starting to be obtained without the use of a heating device, or if it is retained, to make starting possible at considerably lower air temperatures.

With the normal type of pintle nozzle, the spray is directed as shown in "A", Fig. 1, as this spray path used in conjunction with the type of air swirl created has been found to give best all-round engine performance.

Investigations, however, have shown that the hottest zone of the chamber under starting conditions is outside this spray path and more to the center of the spherical chamber and that by spraying into this hot zone considerably improved cold starting could be obtained. Unfortunately, a spray path designed to give optimum starting conditions impairs the engine's maximum power output performance.

The feature of the nozzle is that on starting it directs the fuel spray through an auxiliary injection hole to the hot zone of the combustion chamber, but after ignition occurs and the engine speed rises, the spray is redirected automatically through the pintle hole to the zone where optimum power performance can be obtained.

By its use, minimum starting temperatures, other conditions being equal, are lowered by about 25° F (15° C).

The path of the spray under starting conditions is shown in "B" Fig. 1, the auxiliary spray predominating, and it should be noted that the spray is directed substantially in opposition to the direction of the dense rotating air in the combustion chamber.

This results in improved atomization of the fuel spray, part of which is deflected into the hot central zone of the combustion chamber, thus ensuring immediate ignition. The tendency of the fuel spray to penetrate to the cool wall of the combustion chamber is thus prevented.

At normal operating conditions (shown in "C", Fig. 1) the pintle spray predominates. The small amount that continues to be discharged from the auxiliary orifice does not interfere with the operation of the engine and serves the purpose of keeping the orifice hole free of carbon deposits.

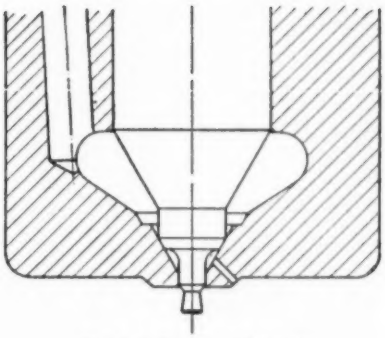


Fig. 2 Section through nozzle.

During idling or light load operation the temperature of the combustion chamber is relatively low. The auxiliary orifice supplies most of the fuel at this time, directing the fuel spray towards the hottest part of the combustion chamber, thus greatly improving operation at low loads.

Fig. 2 shows the nozzle in section; note the needle seating above the auxiliary spray hole and the annular space above the seating. In operation, at starting speed, the oil pressure in the annulus builds up during the pump delivery, lifting the needle from its seating and permitting a flow of fuel into the annulus below the seat from which the auxiliary hole leads. The needle is extended below the seat to fit into the comparatively large diameter pintle hole. At starting speeds the needle is not lifted sufficiently to clear the pintle hole and the fuel is discharged through the auxiliary or starting hole. At running speeds when the pressures in the fuel system are higher, the needle is withdrawn from the pintle hole and the bulk of the fuel is discharged through this hole.

Fig. 1 Illustrating nozzle action.

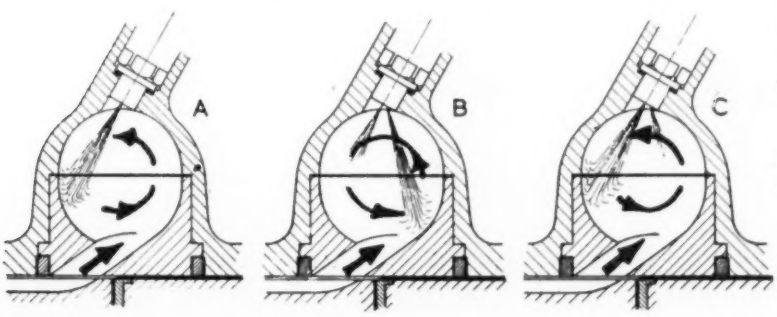
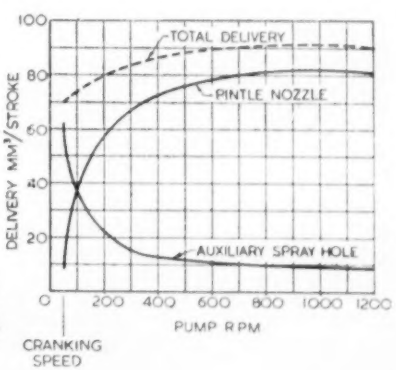


Fig. 3 (right) Fuel delivery characteristics.



Seabees Repatriate Their World War II Equipment

by James Joseph

Bureau Chief, Western Round-Up.

General view of the equipment overhaul shop. Jib cranes and overhead hoists facilitate heavy parts handling.

The Seabees have contracted for the rehabilitation of the greatest mass of repatriated World War II equipment ever salvaged from rusting Pacific island stockpiles. Brought back in 50 shiploads, some 300,000 tons of bulldozers, trucks, jeeps, cranes, tractors and carryalls are undergoing overhaul in Southern California. Nearly 2200 items have already been repaired and restored to service at a cost of only $1,460,000 compared to an original cost of $10,200,000. Much of the heavy equipment is diesel, and often it is being sent right back to the Pacific theater.

Probably the most interesting phase of this repair work, involving about 230 pieces of heavy construction equipment, is being done by Shepherd Tractor and Equipment Co., Los Angeles, one of Caterpillar's largest franchises.

Shepherd's $1,500,000 salvage contract, probably the biggest of its kind for maintenance, is an example of mass-rehabilitation. One hundred twenty technicians are at work converting rusted and corroded heavy pieces of diesel equipment into workable, "like new" machines. To do the job, Shepherd has had to improvise plenty of new handling techniques.

One of these is complete palletization. Diesel tractors and cranes hauled by truck from Port Hueneme, California, the Seabee base, are immediately disassembled by special crews. Each machine as received is assigned a pallet number, and all parts, from the diesel engines to trucks are palletized. Often times 10 to 12 pallets and special risers are required for a single piece of diesel equipment. Inspectors swarm over these pallets, estimating: (1) what parts must be ordered; (2) what parts need only reworking, machining or other repair; (3) delivery date of the rehabilitated unit.

Grinding valve seats in a special section devoted to cylinder head rebuilding.

Mass-maintenance minded technicians might speculate that Shepherd would repair all equipment of a given make and model simultaneously or at least in batches. The difficulty here is shortage of parts. This shortage has so overloaded parts departments of various equipment manufacturers, that Shepherd has had to develop a staggered system, where a limited number of machines from one manufacturer are processed.

This involves palletization of heavy equipment in 1½ acres of outside storage. Shepherd is using its own unique pallets and risers for this operation. Dismantled construction equipment is stored on pallets, each tagged with its assigned number. To save storage space, pallets are piled one atop the other, placed by crane. The risers, made of 2½ by 2½-in. angle iron frames, are box-like structures about 2½ ft. high and heavily reinforced. These steel frames fit over standard 4 by 4 ft. wooden pallets, which allow for transport by standard fork-lifts.

Most of the equipment returned to the U. S. was salvaged after teams from the Navy Bureau of Yards and Docks surveyed former U. S. island bases in 1949. Their reports indicated that great amounts of heavy construction equipment, by then hard to get and expensive in the U. S., could be returned and repaired and put back into operation. About 60 per cent of the equipment returned to Port Hueneme is suitable for rehabilitation. The remaining 40 per cent is being scrapped or sold as surplus. Already

Inserting a piston with the aid of a ring compressor. Engines are mounted on full-rotating positioning stands for maximum convenience.

Shepherd's shop supervisor points to parts protected by masking machined surfaces so as to avoid damage when cleaned by sandblasting.

the Seabees have realized $40,000,000 from sale of this unrepairable equipment.

What was the condition of the returned equipment? Most of its was not war-damaged, but rather rusted and corroded from almost six years of high humidity and negligence. Diesel engines, for instance, required from 2 to 4 liners for a 6-cyl. engine. The damage is usually from rust, not from battle or even work wear. The equipment was abandoned when accelerated mustering-out pulled most skilled mechanics from the islands. Thus, oil was left in many crankcases. Now, after five or six years, acid has badly damaged delicate engine parts.

In diesels, about 50 per cent of the main and connecting rod bearings are corroded and need replacement. Acids from crankcase oils have badly corroded almost all highly machined bearing surfaces. Valve springs and valve guides have been found in the worst condition as have pre-combustion chambers.

Surprisingly, only about half of the diesel injection equipment needs repair and at least half of the fuel pumps need no parts replacement whatever. Maintenance men attribute this to their being tightly sealed against the weather.

Maintenance Schedule at Shepherd

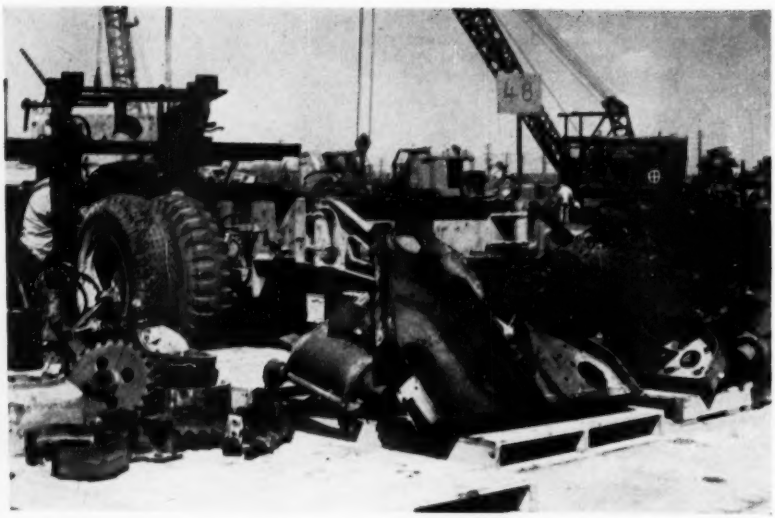
Palletized diesel equipment is stored until ordered parts arrive. Pallets then move to sandblasting after the parts are first masked wherever bearing or bushings might be damaged by sandblasting. At present, dry blasting is being used, but west blasting is being set-up to reduce dust. Two-men sandblasting crews are working around the clock, on 8-hour shifts.

Front idler being built up by hard-facing using shielded arc welder.

After cleaning, pallets belonging to each order number (the completely broken-down machine) are assembled in a pre-machining area. From here, fork-lifts carry pallets to their assigned stations. Pallets of specialized components such as injection systems, fuel pumps, generators and regulators, carburetors and governors go to Shepherd's precision shops.

Parts are cleaned in a special doubled-bottomed tank designed by Shepherd. Four compartments, each supplied from reservoir tanks from which solvents are pumped by air pressure, contain cleaning solvents and Turco Q-2. These get rid of carbons, shellac, and various residue from combustion or corrosion.

Meanwhile, cylinder heads move to a separate department—again via fork lifts. The Navy does not permit cyl-



Diesel powered crane being dismantled. Parts are palletized by categories and each is assigned an order number. Bulk of the machine can be kept together (see below) until wanted for reworking or repair.

inder head welding so damaged heads must be replaced.

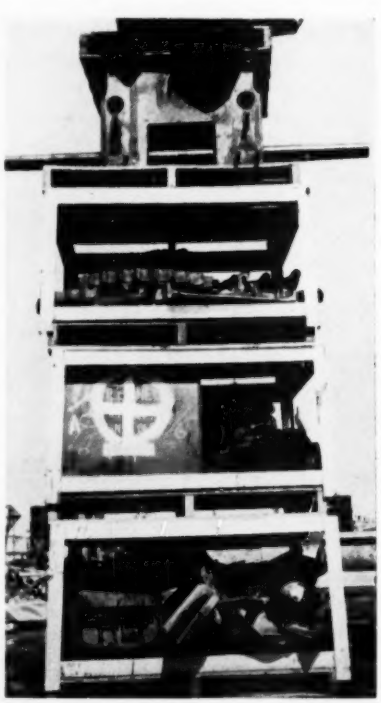
Four special stands hold engine blocks and allow their rotation through 360° by technicians, while still maintaining a fixed distance from the floor. These cantilever stands eliminate floor obstructions, allow mechanics to work without bending or stooping.

While this is going on, tracks are hard-faced in the welding shop. Idler wheels are being built up by hard-facing, using a shielded arc welding machine.

All reworked components, fitted with new parts where needed, and with new welded sections, are given two coats of primer. Different colors are used for the first and second coat so that shopmen know how far each pallet-load has progressed through the closely controlled rehabilitation schedule. Finished components get an additional two coats of olive green.

Twelve stalls within Shepherd's 20,000-sq. ft. inside shop are devoted to repair of heavy diesel equipment. An 11-ton overhead traveling crane, several 3-ton jib cranes and numerous air and electric hoists help to mechanize the job. Reassembly takes place in a 20,000-sq. ft. outside staging area. Thirty men, in six specialized crews, work at reassembly. One crew puts major components together; another assembles trucks; another, transmissions; a fourth crew is charged with electrical reassembly, and rewiring; two more crews are specialized for brake refitting and adjustment and for engine assembly.

Parts routing is unique at Shepherd, especially for a job as large as this. No stockrooms are used (although Shepherd has an 18,700 sq. ft. stock room, containing 1,400,000 items). Instead, incoming parts are routed by job number to the pallets to which they belong, and thence progress along with the original, reworked components through the various steps in rehabilitation. The secret here is the job number assigned to each piece of heavy equipment from the start and the pallets assigned to each job.



Pallets stored vertically with the use of risers to reduce space requirements.

Pallet-loads are broken down into major components and smaller units. Thus, one pallet holds fuel pumps, injection systems and generators. Another carries the engine. Gears and sprockets are assigned to still another. Palletizing is the key to the entire remanufacturing schedule. As soon as all parts have been received and dispatched to their assigned pallet, that piece of equipment is put through the shops. Hardest parts to get are bronze bearings, roller bearings and high alloy steel parts.

One of the tests used to determine what machined components must be replaced, centers around the ability of machinists to remove the corrosion after polishing .001 to .002 in. from the surface. If the defect still remains after .002-in. of polishing, the part is discarded. Some parts in this condition are hard-chromed. Cam-shafts can't be hard-chromed and must be discarded. Ordinarily, some parts might be machined undersize, but since Navy replacement centers wouldn't have undersized parts, that can't be done on this job. Prior to hard chroming, all components are magnafluxed.

The Results

Shepherd expects to rehabilitate the last of its 230 pieces of heavy equipment within a year. Most of it will be sent back to the Pacific area. At Port Hueneme, some 300 civilians are busily at work repairing tracks and jeeps and generator sets. Shepherd's job, one of the largest on record, seems to be showing that on the whole, heavy diesel equipment stood years of neglect better than gasoline engined rigs.

Meanwhile, heavy diesel equipment is being rehabilitated on a mass-scale, and a small fraction of World War II's still serviceable rigs are being repatriated.

Diesels in the Pit and Quarry Industries

by George W. Grupp

DIESEL engines are used extensively in the pit and quarry industries, although the exact number is unknown. Accurate statistics being unavailable, one can safely say, however, that the total number of diesel units owned and operated by the pit and quarry industries runs into five digits.

A large share of these units were acquired during the past seven years as the diesel engines became better known to the industry for their dependability, portability, economy and mechanical efficiency.

Today diesel units are used to provide power for all types of operations, from the removal of overburden to the shipment of the products. Diesel powered bulldozers, scrapers, shovels, draglines, slack line cableways and trucks are used in removing overburden. They are frequently the power source for air compressors used in drilling operations, prime movers in excavating and loading operations after the rock has been blasted loose, and in hydraulic and dredging operations. They are used as a form of power for intra-plant transportation between the pits and the preparation plants, and at the preparation plants they are a source of power for crushing, grinding, screening, classifying, washing, cooling and drying operations, as well as for storage, packaging and loading operations.

The advantages of diesel engines in the pit and quarry industries are many. Steam engines lack the versatility of diesel engines, especially where loads are small and mobility is required as in the case of portable crushing and screening plants. The usage of dual-fuel engines have proved their value in stationary pit and quarry power plants. Their low fuel cost and high thermal efficiency when compared with other forms of energy have enabled them to pay for themselves out of savings and better performance in a comparatively few years.

Tractor with Traxcavator attachment expediting the loading of stone on way to crusher.

Diesel powered portable pit and quarry equipment, especially in the production of stone and gravel aggregate has presented an unexpected problem of competition to the owners of large stationary plants. As a result these large producers are surveying the possibilities of using diesel portable plants for competitive purposes.

In selecting diesel powered equipment for the pit and quarry industries, special considerations should be given to operation and maintenance of the units. From the maintenance standpoint thought should be given to (1) accessibility of parts, (2) interchangeability of parts, (3) protection against pit dust, (4) proper matching of equipment to avoid power wastage or excessive loading, (5) ease of adjustment. From the operational end attention should be given to (1) quick starting ability in both cold and hot climates, (2) operators comfort of mobile units, (3) proper balance of weight, speed and power of mobile units, (4) ease of operation.

To attain maximum operating efficiency of equipment the monthly schedule for maintenance of each piece of equipment should be staggered so that all units do not require attention at the same time.

Number of Establishments, Total Horsepower and Motive Power of Quarry Industry, 1939

Type of pit or quarry	No. of Establishments	Horsepower			Total No. Units Condsidered	Motive Power		
		Total	Percent Stationary	Mobile		Steam	Electric	Intl. Comb.
Barite	47	10,452	44	56	51	8	3	40
Basalt	116	96,700	56	44	194	64	43	87
Bentonite	....	6,958	64	36	...	...	...	...
Common clay and shale	679	62,000	14	86	640	211	192	277
Common sand and gravel	1,383	643,026	54	46	3,781	584	789	2,408
Diatomite	14	6,646	72	28	...	...	...	...
Feldspar	59	5,668	36	64	12	2	1	9
Fire clay	350	32,000	41	59	...	...	...	...
Fluorspar	61	20,506	90	10	9	1	4	4
Foundry sand	146	27,035	39	61	180	31	30	119
Fuller's Earth	22	14,800	...	...	...	...	...	...
Glass sand	40	29,154	81	19	84	9	37	38
Granite	...	105,000	75	25	283	77	159	47
Gypsum	59	28,539	64	36	35	1	17	17
Kaolin and ball clay	401	33,000	60	40	87	24	4	59
Limestone	1,192	790,000	53	47	...	...	...	...
Marble	6	18,000	77	23	...	...	...	...
Native asphalt and bitumens	23	494,864	58	42	41	20	4	17
Peat	25	2,759	43	47	28	4	...	24
Phosphate rock	40	112,531	82	18	204	37	140	27
Rock salt	17	23,002	78	12	42	1	36	5
Sandstone	68	35,502	60	40	...	...	...	...
Slate	11	30,000	80	20	...	...	...	...

SOURCE: U. S. Census. Figures of the 1949 census are not yet available.

Now let us see what diesels are doing in some pits and quarries across the country. The Iafolla Crushed Stone Company of Portsmouth, N. H. uses a Chicago Pneumatic diesel powered portable compressor for their two Cleveland D-14 wagon drills. After blasting the trap rock loose, it is then broken into small pieces with a skull cracker or drop ball attached to a cable of a 65-ft. boom Northwest crawler crane. Next the rock is loaded into trucks with a Northwest No. 6 diesel shovel with a 1½-cu. yd. Amsco dipper. An International Harvester diesel tractor with a bulldozer attachment cleans up the quarry and maintains the roadway for the trucks. In their shop all necessary repair and maintenance work is performed except that which requires specialized training.

The Vermont Mineral Products, Inc. of Chester, Vermont use to economic advantage a Caterpillar diesel tractor with a Trackson traxcavater to load trucks with talcum rock.

The Buffalo Slag Company in hauling slag to its new Woodlawn, N. Y. plant from the Bethlehem Steel plant at Lackawanna, N. Y. uses four 15-ton quarry type Euclid diesel trucks. A 4-cu. yd. capacity diesel electric P. & H. shovel loads each of these trucks in about 1.25 minutes.

For some time the Kingston Trap Rock Company of Kingston, N. Y. has speeded up its overburden stripping operations with rooters and bulldozers powered with Caterpillar diesels.

In 1947 the Maryland Slag Company of Baltimore, Md. bought a General Electric 65-ton diesel electric locomotive for hauling slag cars. Because of the economical operation of this locomotive, they bought two similar types of locomotives in 1949. And in 1950 they replaced their remaining steam locomotive with an 80-ton General Electric diesel locomotive for its Lordstown, Ohio plant. All four diesel locomotives are used to haul slag from steel plant dump pits to their crushing mills. Each locomotive makes an average of 16 trips per day with a train of five cars carrying a total of 165 tons of slag.

Another Baltimore concern, the Arundel Supply Company, has discovered that with one International diesel bulldozer they can strip in three hours of time over 2 acres of overburden from their sand and gravel pits which formerly required six hours with a dragline.

At Roanoke, Virginia the Blue Ridge Stone Company, in a 4.5 hour period loaded trucks at the rate of 664 tons per hour with their 2½-cu. yd. Koehring diesel shovel.

Another Roanoke firm, the Webster Brick Company, is using an International diesel wheeled tractor with a 4-cu. yd. scraper to move clay a distance of 1000 yds. from the pits to the brick works.

In Tate, Georgia the Georgia Marble Company has been obtaining excellent results with their Link-Belt ½-cu. yd. shovel with a Caterpillar diesel in the loading of calcium carbonate.

At Miami, Florida the Murphy-Mills Corporation uses two International Harvester diesel engines,—one for a generator set, and one for its rock crushing plant. After 3000 work hours of operation during the past two years their low cost of operation has even surprised their owners.

In Winsfield, La. the Carey Salt Company is using a diesel crawler tractor shovel 881 ft. below the surface, because they find it expedites extracting operations.

The Eel River Mining Company, Inc. of Cleve, West Virginia uses Marion diesel power shovels. In a period of 14 months they moved 1,000,000 cu. yd. of overburden and 100,000 tons of coal.

The Kelley Island Lime & Transport Company, on the Great Lakes, replaced a 65-ton steam locomotive with a 50-ton General Electric diesel locomotive and saves about $1000 a month in operating costs to perform the same services.

At Alpena, Michigan the Wyandotte Chemical Corporation has replaced its electric haulage system with a fleet of 13 rear dump 22-ton diesel Euclid trucks. Operating two shifts a day, six days a week, these diesel trucks haul about 300 tons of limestone per hour between the pit and the preparation plant,—a distance of 0.87 miles.

The American Cyanamide Calco Chemical Division saves about $1,700 a month in transfer and intraplant switching costs with a 65-ton General Electric diesel locomotive.

The McHenry Sand & Gravel Company of McHenry, Illinois has a 60-by 40-ft. maintenance shop where it keeps its dragline, loaders and other equipment in shape for the best possible results.

A Caterpillar diesel tractor with a 15-ton Athey rock trailer makes an average of 8.5 round trips of 6000 feet per hour between an Illinois limestone pit and the crushing plant. In other words this diesel combination is hauling 127 tons per hour or 1010 tons per 8 hour day.

The Crystal Lake Crushed Stone Company of Sheboygan, Wisconsin, with its International Harvester diesel engine, is crushing rock at a combined fuel and lubricating oil cost of 3.2 cents per cu. yd.

Gustafson & Reynolds of Sioux Falls, Iowa uses a Caterpillar diesel powered portable crusher and two Caterpillar diesel powered graders in their quarry operations. With these graders they stockpile about 2000 cu. yd. of gravel in 10.5 hours time.

Bulldozer pushing 8 to 10 ton blocks into a stockpile area.

A midwestern firm uses two 15-ton diesel Euclid trucks and one diesel power shovel in its limestone quarry operations. The trucks haul an average of 1935 tons of limestone in 8 hours between the pit and the crushing plant, —a distance of about 3000 ft.

The Riverside Stone & Materials Company of St. Louis, Mo. use a 1-cu. yd. Northwest power shovel which handles 1200 tons of limestone per day. The gasoline engine of this shovel was replaced with a General Motors diesel engine with the result that the fuel consumption is now only 35 gal. of diesel fuel per 8 hour day, as compared with 75 gal. of gasoline.

The T. L. Wright Lumber Company of Doniphan, Missouri dredges gravel and sand from the Current River with a 2-cu. yd. Sauerman slackline cableway system, powered with a Caterpillar diesel engine. The dredge speed is 200 fpm and the conveyor speed is 600 fpm. This system produces from 400 to 600 tons of sand and gravel per day.

Bakers Quarry of Kahoka, Missouri operates an agstone plant which has a capacity of 800 to 1000 tons per day. In the operation of this project all generators and various stationary and portable equipment are powered with Caterpillar diesel engines.

Another 100 per cent Caterpillar diesel plant is that of Sargent Brothers, Inc. of Winterset, Iowa, who produce about 100,000 tons of road rock and lime per year.

Number & Types of Material Handling Units Used by Quarry

Type of pit or quarry	No. of pits, quarries and preparation plants	No. of Units Reported Bucket loaders	Cableways	Clamshells	Cranes, derricks and hoists	Dragline excavators	Power shovels	Pumps, sand & gravel	Scraper loaders	Tractor scraper	Other types of equipment
Barite	47	...	...	3	...	...	44	...	4	...	...
Basalt	116	17	...	39	...	...	196	...	...	...	...
Common clay and shale	679	...	...	...	...	68	539	...	2	...	25
Common sand and gravel	1,383	...	...	816	...	646	1,090	614	242	...	379
Feldspar	59	...	...	...	8	...	1	...	3	1	...
Fire clay	350	...	...	6	4	...	107	...	...	...	2
Fluorspar	61	...	...	1	...	...	4	...	...	...	13
Foundry sand	146	...	...	19	...	17	83	15	2	...	40
Glass sand	40	...	...	10	...	1	41	23	5	...	...
Granite	...	...	...	32	336	...	110	...	...	...	...
Gypsum	59	...	...	4	...	11	24	...	1	6	10
Kaolin and ball clay	401	...	...	...	...	16	58	...	...	...	13
Limestone	1,192	101	...	230	47	84	1,360	...	79	...	121
Marble	6	...	...	...	84	...	5	...	...	...	...
Native asphalt-bitumens	23	...	...	10	...	3	28	...	...	...	2
Peat	25	...	...	3	...	4	6	...	1	14	...
Phosphate rock	40	...	...	23	...	68	...	113	...	...	...
Rock salt	17	...	...	...	11	2	...	...	29	...	...
Slate	11	...	22	...	20	...	32	...	...	...	...

SOURCE: U. S. Census Bureau: Census of 1939; Figures of the 1949 census are not yet available.

Number and Distribution of Cement, Gypsum, Lime, Sand, Gravel, Crushed Stone and Other Quarry Plants in 1948

State	Number	State	Number
Alabama	120	Nebraska	208
Arizona	39	Nevada	48
Arkansas	58	New Hampshire	19
California	656	New Jersey	213
Colorado	102	New Mexico	19
Connecticut	85	New York	452
Delaware	19	North Carolina	127
Dist. of Columbia	15	North Dakota	4
Florida	136	Ohio	667
Georgia	117	Oklahoma	78
Idaho	35	Oregon	121
Illinois	518	Pennsylvania	688
Indiana	389	Rhode Island	17
Iowa	259	South Carolina	43
Kansas	192	South Dakota	55
Kentucky	171	Tennessee	170
Louisiana	57	Texas	205
Maine	43	Utah	68
Maryland	117	Vermont	52
Massachusetts	206	Virginia	195
Michigan	325	Washington	153
Minnesota	145	West Virginia	86
Mississippi	27	Wisconsin	297
Missouri	492	Wyoming	36
Montana	41		
		Total	8,385

SOURCE: Pit & Quarry Handbook & Directory

Three General Motors diesel engines power one hammermill and two jaw crushers operated by B. L. Anderson of Iowa, who produces an average of 130 tons of road rock per hour.

Schildberg Construction Company of Greenfield, Iowa, which produces about 1200 tons of crushed rock per day, use three Caterpillar diesel engines to power their portable crushing plant, their screens, and their jaw crushers.

The Arizona Portland Cement Company of Rillite, Arizona, which has a daily capacity of 1000 bbl., generates its electricity with a 3000-kw. generator set, powered with diesel engines.

The 100-ft. dredge "Erle P. Halliburton" is used by the Halliburton Portland Cement Company of Corpus Christi, Texas to dredge oyster shells in Nueces Bay for its cement plant. The main engine is a 900-hp. Chicago Pneumatic diesel engine.

The West Texas Stone Company has saved thousands of dollars in handling limestone blocks with an International diesel crawler tractor with a side boom. Formerly 25 men operated 6 hoists and 6 derricks to produce ten 3-ft. 6-in. by 7-ft. 6-in. by 20-in. limestone blocks a day. Now 4 men with the diesel tractor and side boom produce 18 blocks a day.

About 1400 cu. yd. of conglomerate flint and sandstone are produced per 10-hour day by the N. E. Ruby Construction Company of San Marcos, Texas with a Caterpillar diesel powered crushing and screening plant.

The Uvaldo Rock Asphalt Company of Blewett, Texas, which produces about 500,000 tons of natural limestone rock asphalt a year, uses a 430-hp. Cooper-Bessemer diesel engine to generate about 40 per cent of its power needs. This firm also owns and operates two General Electric locomotives (one 42-ton and one 65-ton) to haul about 100 freight cars between the plant and the mainlines of the Southern Pacific and Missouri Pacific railroads.

A Caterpillar diesel generator set powers ten motors which run the conveyors, crusher and screens of the Desert Materials Corporation. Their crownite pumice is mined with a 2½-cu. yd. Link-Belt diesel dragline, and hauled 8 miles in 40-cu. yd. capacity Kenworth trucks powered with Cummins diesel engines.

In Inyo County, California over 100,000 cu. yd. of crownite pumice was removed in 45 days with a 15-ton ripper and a Caterpillar diesel tractor equipped with a scraper blade and two 18-cu. yd. Tournpulls.

The Rosenburg Lime Products Company of Rosenburg, Oregon powers its agstone plant with a 180-hp. Buda diesel generating set.

The C. & E. Construction Company of Yakima, Washington uses three Caterpillar diesel engines to power its crushers which deliver 290-cu. yd. of rock per hour. These engines are going strong after a total of 42,000 work hours of usage.

The small 10,000 tons per annum agstone plant of the Miller Lime Company of Goldbar, Washington uses a 45-hp. diesel engine to generate the electricity required to power its conveyors, screens and hammer mill.

From these illustrations one can glean that diesels are performing excellent service throughout the United States in the pit and quarry industries. The purpose in listing so many examples is to point out the diversity of equipment and application. Naturally there is plenty of room for further expansion of diesels as prime movers in these industries. And in this connection it will be interesting to watch the outcome of experiments being made with diesel electric power by the R. G. LeTourneau, Inc. They are planning to provide the pit and quarry industries with a prime mover which will offer smoothness of operation and a wide range of speeds with push button control.

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Horsepower, 51 to 100

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Columbus, Indiana

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Horsepower, 501 to 1000

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7000 Bennett Street
Pittsburgh 8, Pa.

Additives

See also "Fuel Oil Additives"; "Fuel Oil Treatment, Diesel"

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio

Air Cleaners

See also "Air Filters"; "Filters, Air"; etc.

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.

VORTOX CO., INC.
Claremont, Calif.

Air Cleaners, Oil Washed

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 4, Minn.

Air Compressor Oils

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma

THE TEXAS CO.
135 East 42nd St.
New York 17, N. Y.

Air Compressors

See also "Compressors, Air"; "Starting Units, Engine Driven Air Compressors"

THE COOPER-BESSEMER CORP.
Mount Vernon, Ohio

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

QUINCY COMPRESSOR CO.
217 Maine Street
Quincy, Ill.

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

Air Compressors, Diesel Driven

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

Air Compressors, Diesel Starting

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

QUINCY COMPRESSOR CO.
217 Maine Street
Quincy, Ill.

JOHN REINER & CO.
12-12 37th Ave.
Long Island City 1, N. Y.

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

Air Dryers, Instrument

J. F. PRITCHARD & CO.
908 Grand Ave.
Kansas City, Mo.

Air Filters

See also "Air Cleaners"; "Filters, Air"; etc.

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.

FARR COMPANY
2615 Southwest Drive
Los Angeles 43, Calif.

Air Filters, Crankcase

See also "Breather Caps"; etc.

FRAM CORP.
Providence 16, R. I.

Air Velocity Meters

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle Street
Chicago 10, Ill.

Air Stack Caps, for Air Cleaners

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.

Alarm Systems, Pressure & Temperature

See also "Signal Systems"; "Alarm for Liquid Level"; "Pressure Temperature"; "Electric Current".

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

PENN ELECTRIC SWITCH CO.
Goshen, Indiana

ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

SYNCHRO START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

Alloy Steel Bolts & Nuts

See also "Bolts"; "Engine Bolts"; "Nuts and Studs"; "Special . . . Studs"; "Connecting Rod Bolts & Nuts"

ERIE BOLT & NUT COMPANY
1325 Liberty Street
Erie, Pa.

Alternators

See also "Generators, A.C."

THE LEECE-NEVILLE CO.
5109 Hamilton Ave.
Cleveland 14, Ohio

Ammeters

See also "Meters, Electrical Indicating"; "Volt-Ammeter, Clamp-On Type"

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa

ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Ammeters—Tong Test (Clamp On) Type

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

Antifreezes

NATIONAL CARBON CO.
DIVISION OF UNION CARBIDE & CARBON CORP.
30 East 42nd Street
New York 17, N. Y.

THE TEXAS CO.
135 East 42nd St.
New York 17, N. Y.

Anti-Rust Compounds

See also "Rust Preventatives"

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Asbestos, Sheet

VICTOR MFG. & GASKET CO.
5750 W. Roosevelt Road
Chicago 50, Ill.

Automatic Honing Machine

VAN NORMAN CO.
Springfield 7, Mass.

Automotive Diesel Fuel

See also "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Diesel Fuel Oils"; "Motor Fuels"

STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.

THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

Automotive Greases

See also "Greases," "Lubricants"

THE TEXAS CO.
135 East 42nd St.
New York 17, N. Y.

Automotive Lubricating Oils

THE TEXAS CO.
135 East 42nd St.
New York 17, N. Y.

Auxiliary Combination Units

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

GRIFFIN EQUIPMENT CORP.
880 East 141st Street
New York 54, N. Y.

JOHN REINER & CO.
12-12 37th Ave.
Long Island City 1, N. Y.

Auxiliary Diesel Generating Sets

See also "Diesel Generating Sets"; "Generating Sets, Electric"; "Emergency Diesel Generator Systems"; "Emergency Lighting Plants"; "Packaged Generators"; "Standby Electric Plants"; "Port-Electric Plants".

ABOE INC.
Empire State Bldg.
New York 16, N. Y.

THE COOPER-BESSEMER CORP.
Mount Vernon, Ohio

INTERNATIONAL DIESEL ELECTRIC CO., INC.
13-02 44th Avenue
Long Island City 1, N. Y.

Babbitt Metal

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Balancing Machines, Static

TAYLOR DYNAMOMETER & MACHINE CO.
528 W. Highland Ave.
Milwaukee 3, Wis.

Ball Bearings

See also "Bearings, Ball"

SKF INDUSTRIES, INC.
Front St. & Erie Ave.
P. O. Box 6731
Philadelphia 32, Pa.

Bars, Bronze

See also "Bronze Bar Stock"

JOHNSON BRONZE COMPANY
470 S. Mill St.
New Castle, Pa.

Batteries, Diesel Locomotive

See also "Starting Batteries, Storage"

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

SURRETTE STORAGE BATTERY CO., INC.
Jefferson Avenue
Salem, Mass.

Batteries, Diesel Starting

See also "Starting Batteries, Storage"

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

Batteries, Electric Storage

DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
Anderson, Indiana

WILLARD STORAGE BATTERY CO.
246-286 E. 131st St.
Cleveland 1, Ohio

Batteries, Flashlight, Lantern and Signal

See also "Dry Batteries".

NATIONAL CARBON CO.
DIVISION OF UNION CARBIDE & CARBON CORP.
30 East 42nd Street
New York 17, N. Y.

Batteries, Locomotive, Nickel Cadmium Type

NIFE, INC.
165 Broadway—Room 1002
New York, N. Y.

Batteries, Marine, Nickel Cadmium Type

NIFE, INC.
165 Broadway—Room 1002
New York, N. Y.

Batteries, Marine Storage

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

SURRETTE STORAGE BATTERY CO., INC.
Jefferson Avenue
Salem, Mass.

Batteries, Stationary, Nickel Cadmium Type

NIFE, INC.
165 Broadway—Room 1002
New York, N. Y.

Batteries, Stationary Storage

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

Battery Service Accessories

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Ill.

WILLARD STORAGE BATTERY CO.
246-286 E. 131st St.
Cleveland 1, Ohio

Bearing Packers

BENNETT-FERAGEN, INC.
1005 South Lafayette Blvd.
South Bend, Indiana

Bearing Rebabbitting

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

Bearing Wear Detectors

BENNETT-FERAGEN, INC.
1005 South Lafayette Blvd.
South Bend, Indiana

Bearings, Aluminum

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bearings, Ball Type

See also "Ball Bearings"

LINK-BELT COMPANY
519 North Holmes Ave.
Indianapolis 6, Indiana

Bearings, Bronze

See also "Bronze Bearings"

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bearings, Bronze and Steel, Babbitt-Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

LINK-BELT COMPANY
2410 West 18th Street
Chicago 8, Ill.

Bearings, Copper-Lead

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Mich.

Bearings, Lead-Bronze

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Mich.

JOHNSON BRONZE CO.
470 S. Mill St.
New Castle, Pa.

Bearings, Piston Pin

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bearings, Roller Type

LINK-BELT CO.
519 North Holmes Ave.
Indianapolis 6, Indiana

Bearings, Roller, Cylindrical Spherical

LINK-BELT CO.
519 North Holmes Ave.
Indianapolis 6, Indiana

Bearings, Self-Lubricating

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

LINK-BELT CO.
2410 W. 18th St.
Chicago 8, Ill.

Bearings, Sleeve, Copper-Lead Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bearings, Steel Back, Copper-Lead Lined

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pa.

Bearings, Steel Back, Copper-Lead and Cast or Plated Babbitt Lined

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pa.

Bellows Metallic

CHICAGO METAL HOSE CORP.
1315 So. 3d Ave.
Maywood, Illinois

Bellows, Stainless Steel

ZALLEA BROS.
Taylor & Locust Sts.
Wilmington, Del.

Belting, Chain

LINK-BELT CO.
220 South Belmont Ave
Indianapolis 6, Indiana

Belting, V-Type

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

Blowers and Compressors, Scavenging and Supercharging

See also "Supercharging Blowers"; other headings under "Blowers"; "Turbochargers and Superchargers"

INGERSOLL-RAND COMPANY
11 Broadway
New York, N. Y.

ROOTS-CONNERSVILLE BLOWER CORP.
Connersville, Indiana

Blowers, Centrifugal

DR. ALFRED J. BUCHI
Engineering Office
Winterthur, Switzerland
U. S. Office, 520 Munsey Bldg.
Washington 4, D. C.

Blowers, Positive Displacement

READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

Blowers, Scavenging and Supercharging

DR. ALFRED J. BUCHI
Engineering Office
Winterthur, Switzerland
U. S. Office, 520 Munsey Bldg.
Washington 4, D. C.

Blowers, Scavenging-Oil and Gas Engine

READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

Blowers, Supercharging

READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

Boilers, Exhaust Gas

See also "Exhaust Gas Economizer"; "Waste Heat Boilers"

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Boilers, Waste Heat

See note under heading above.

BROWN FINTUBE CO.
300 Huron St.
Elyria, Ohio

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Bolts

See also "Alloy Steel Bolts and Nuts"; "Engine Bolts, Studs & Nuts"; "Special . . . Studs"; "Connecting Rod Bolts & Nuts"

ERIE BOLT & NUT COMPANY
1325 Liberty St.
Erie, Pa

Brake Drum Lathes

VAN NORMAN CO.
Springfield 7, Mass.

Brazing, Copper, Atmospheric

BURGESS-NORTON MFG. CO.
Geneva, Ill.

Breather Caps

See also "Air Filters, Crankcase"

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.

Breather Filters

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

Breathers, Crankcase

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 4, Minn.

Bronze Bar Stock, Completely Finished

See also "Bars, Bronze"

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bronze Bar Stock, Semi-Finished

FEDERAL MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

Bronze Bearings

See also "Bearings, Bronze"

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Mich.

Bronze Washers

See also "Washers"

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Brushes, Carbon and Graphite

NATIONAL CARBON CO.
DIVISION OF UNION CARBIDE & CARBON CORP.
30 East 42nd Street
New York 17, N. Y.

Bushings, Bronze

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

Bushings, Bronze, Cast and Split-Rolled

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

Bushings, Hard-Rolled Bronze

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pa.

Bushings, Steel Back, Babbitt Lined

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pa.

Bushings, Steel Back, Lead-Bronze Lined

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pa.

Bushings, Steel, Split-Rolled

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Mich.

Cables, Battery

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

Carbon Brushes

NATIONAL CARBON CO.
DIVISION OF UNION CARBIDE & CARBON CORP.
30 East 42nd Street
New York 17, N. Y.

Carbon Solvents

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio

Cast Camshafts

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Mich.

Cast Crankshafts

See also "Crankshafts".

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Mich.

Castings Bronze, Brass and Aluminum

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Castings, Centrifugal

CENTRIFUGAL FOUNDRY CO.
Muskegon, Mich.

Castings, Gray Iron (Centrifugal)

See also "Gray Iron and Steel Castings".

CENTRIFUGAL FOUNDRY CO.
Muskegon, Mich.

Castings, Malleable Iron

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

Castings, Steel

LINK-BELT CO.
220 S. Belmont Ave.
Indianapolis 6, Indiana

Centrifugally Cast Cylinder Liners

See also "Liners, Diesel Cylinder"; "Cylinder Liners".

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Michigan

Centrifugal Purifiers, Fuel Oil

See also "Oil Purification Systems, Centrifugal".

THE DE LAVAL SEPARATOR CO.
165 Broadway
New York 6, N. Y.

THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Centrifugal Purifiers, Lube Oil

See heading above.

THE DE LAVAL SEPARATOR CO.
165 Broadway
New York 6, N. Y.

THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Centrifuse Brake Drums

CAMPBELL, WYANT & CANNON FDRY. CO.
Muskegon 83, Michigan

Chains, Control

LINK-BELT COMPANY
220 So. Belmont Ave.
Indianapolis 6, Indiana

MORSE CHAIN CO.
7601 Central Avenue
Detroit 8, Mich.

Chains, Dual Drive

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Michigan

Chains, Dual Engine Drive

See also "Dual Engine Chain Drives".

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

Chains, Power Transmission

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Mich.

Chains, Roller

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Mich.

Chains, Silent

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Mich.

Chains, Timing

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Mich.

Chargers, Battery

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Ill.

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Chromium Treated Parts

KOPPERS COMPANY, INC.
METAL PRODUCTS DIVISION
Bush and Hamburg Sts.
P.O.B. 626
Baltimore 3, Md.

Cleaning Compounds

MAGNUS CHEMICAL CO., INC.
91 South Ave.
Garwood, New Jersey

OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.

PETROLEUM SOLVENTS CORP.
331 Madison Avenue
New York 17, N. Y.

Cleaning Machines (Diesel Engine Parts)

MAGNUS CHEMICAL CO., INC.
91 South Ave.
Garwood, New Jersey

Clutches

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Mich.

ROCKFORD CLUTCH DIVN.
BORG-WARNER CORP.
1301 Eighteenth Ave.
Rockford, Illinois

Clutches, Free Wheeling

MORSE CHAIN CO.
7601 Central Avenue
Detroit 8, Mich.

Clutches, Friction and Jaw

BARBOUR STOCKWELL CO.
205 Broadway
Cambridge 39, Mass.

LINK-BELT CO.
300 W. Pershing Rd.
Chicago 9, Ill.

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Mich.

ROCKFORD CLUTCH DIVN.
BORG-WARNER CORP.
1301 Eighteenth Ave.
Rockford, Illinois

Combustion, Diesel

LANOVA CORP.
38-15 30th Street
Long Island City 1, N. Y.

Combustion Heaters

See also headings under "Heaters".

HUNTER MFG. CO.
1550 East 17th St.
Cleveland 14, Ohio

Combustion Indicator

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Ill.

Combustion Systems

LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

Compression Testers, Diesel Engine

See also "Indicators, Diesel Engine".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

Compressors, Air

See also "Air Compressors"; "Starting Units, Engine Driven Air Compressor".

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

Compressors, Reciprocating, Air and Gas, All Drives

THE COOPER-BESSEMER CORP.
Mount Vernon, Ohio

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

Conditioners, Fuel & Lube Oil

See also "Reclaimers, Oil"; headings under "Purifiers"; headings under "Oil".

THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.

Conduit, Electrical Wiring, Flexible

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

Connecting Rod Bolts & Nuts

See also "Bolts"; "Engine Bolts, Nuts & Studs; "Special . . . Studs"; "Alloy Steel Bolts & Nuts".

THE CHICAGO SCREW CO.
2701 Washington Blvd.
Bellwood, Ill.

ERIE BOLT & NUT CO.
1325 Liberty Street
Erie, Pa.

Connecting Rod Borers

VAN NORMAN CO.
Springfield 7, Mass.

Connecting Rods

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

Controls, Automatic Starting

AUTOMATIC SWITCH COMPANY
391 Lakeside Avenue
Orange, New Jersey

SYNCHRO START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Illinois

Controls, Cooling Water

ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Controls, Electrical

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

Controls, Pressure

THE MERCOID CORPORATION
4201 Belmont Avenue
Chicago 41, Illinois

PENN ELECTRIC SWITCH CO.
Goshen, Indiana

ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

UNITED ELECTRIC CONTROLS CO.
85 School Street
Watertown 72, Mass.

Controls, Temperature

AMERICAN MOTORS CO.
21 Nevins Avenue
Richmond 5, California

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

THE MERCOID CORPORATION
4201 Belmont Avenue
Chicago 41, Illinois

PENN ELECTRIC SWITCH CO.
Goshen, Indiana

THE POWERS REGULATOR CO.
2720 Greenview Avenue
Chicago 14, Ill.

ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

UNITED ELECTRIC CONTROLS CO
85 School Street
Watertown 72, Mass.

Coolers, Evaporative Type

See headings under "Evaporators".

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Illinois

BUFFALO FORGE CO.
473 Broadway
Buffalo, N. Y.

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

THE TRANE CO.
La Crosse, Wisconsin

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Coolers, Jacket Water

See also "Exchangers, Heat"; "Water Cooling Equipment"; and headings under "Heat Exchangers".

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 4, N. Y.

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

BUFFALO FORGE CO.
473 Broadway
Buffalo, N. Y.

DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth, N. J.

THE FLUOR CORP.
403 W. Eighth St.
Los Angeles 22, Calif.

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

THE MARLEY COMPANY, INC.
Fairfax and Marley Roads
Kansas City 15, Kansas

J. F. PRITCHARD & CO.
908 Grand Avenue
Kansas City, Missouri

ROSS HEATER & MFG. CO., INC.
1405 West Avenue
Buffalo 13, N. Y.

THE TRANE CO.
La Crosse, Wisconsin

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Oil and Water

See also "Oil Coolers"; "Water Cooling Equipment"; "Exchangers, Heat" and headings under "Heat Exchangers".

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 4, N. Y.

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

BROWN FINTUBE CO.
300 Huron Street
Elyria, Ohio

THE FLUOR CORP.
403 W. Eighth St.
Los Angeles 22, Calif.

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

J. F. PRITCHARD & CO.
908 Grand Avenue
Kansas City , Missouri

ROSS HEATER & MFG. CO., INC.
1405 West Avenue
Buffalo 13, N. Y.

STRUTHERS-WELLS CORP.
Warren, Pa.

THE TRANE CO.
La Crosse, Wisconsin

YOUNG RADIATOR CO.
Racine, Wisconsin

Cooling Towers

See also "Spray Towers".

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

THE FLUOR CORP.
403 W. Eighth St.
Los Angeles 22, Calif.

THE MARLEY COMPANY, INC.
Fairfax and Marley Roads
Kansas City 15, Kansas

J. F. PRITCHARD & CO.
908 Grand Ave.
Kansas City 6, Missouri

Cooling Water Treatment

D. W. HAERING & CO., INC.
205 W. Wacker Drive
Chicago 6, Ill.

Core Oils

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Corrosion Inhibitors

D. W. HAERING & CO., INC.
205 W. Wacker Drive
Chicago 6, Ill.

Couplings, Chain

LINK-BELT CO.
220 So. Belmont Ave.,
Indianapolis, Ind.

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Mich.

Couplings, Flexible

AJAX FLEXIBLE COUPLING CO., INC.
139 English Street
Westfield, New York

DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, N. J.

KOPPERS CO., INC.
METAL PRODUCTS DIVISION
Bush and Hamburg Sts.
P.O.B. 626
Baltimore 3, Md.

LINK-BELT CO.
220 So. Belmont Ave.,
Indianapolis 6, Ind.

LOVEJOY FLEXIBLE COUPLING CO.
5009 West Lake Street
Chicago 44, Illinois

MORSE CHAIN CO.
7601 Central Avenue
Detroit 8, Mich.

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

Couplings, Floating Shaft Type

KOPPERS CO., INC.
METAL PRODUCTS DIVISION
Bush and Hamburg Sts.
P. O. Box 626
Baltimore 3, Md.

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Mich.

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

Couplings, Hydraulic

AERO-COUPLING CORP.
3015 Winona Ave.
Burbank, Calif.

AEROQUIP CORP.
Jackson, Michigan

GUSTIN-BACON MFG. CO.
Kansas City 7, Mo.

LINK-BELT CO.
220 So. Belmont Ave.,
Indianapolis, Ind.

Couplings, Marine Propeller Shaft

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Mich.

Couplings, Self-Aligning

KOPPERS CO., INC.
METAL PRODUCTS DIVISION
Bush and Hamburg Sts.
P.O.B. 626
Baltimore 3, Md.

LINK-BELT CO.
220 So. Belmont Ave.,
Indianapolis, Ind.

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

Couplings, Self-Sealing

AERO-COUPLING CORP.
3015 Winona Ave.
Burbank, Calif.

AEROQUIP CORP.
Jackson, Michigan

Crankshaft Alignment Indicator

LISTER-BLACKSTONE, INC.
858 Graybar Bldg.
420 Lexington Ave.
New York 17, N. Y.

Crankshaft Bearings

See also headings under "Bearings".

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pa.

Crankshaft Grinders

LEMPCO PRODUCTS, INC.
5490 Dunham Rd.
Bedford, Ohio

VAN NORMAN CO.
Springfield 7, Mass.

Crankshaft, Machinists

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

THE OHIO CRANKSHAFT CO.
3800 Harvard Avenue
Cleveland, Ohio

Crankshafts

See also "Cast Crankshafts".

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

THE OHIO CRANKSHAFT CO.
3800 Harvard Avenue
Cleveland, Ohio

Crankshafts, Emergency Repairs

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

Crankshafts, Thermit Welded

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

Crawler Tractors, 4 Cycle, High Speed, 31.3 to 148 DHP

INTERNATIONAL HARVESTER CO.
180 N. Michigan Ave.
Chicago 1, Ill.

Cutting Fluids

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Cutting Oils

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma

THE PURE OIL CO.
35 East Wacker Drive
Chicago 1, Illinois

SHELL OIL CO.
50 West 50th St.
New York 20, N. Y.

SHELL OIL CO.
100 Bush Street
San Francisco 6, Calif.

SINCLAIR REFINING CO.
630 Fifth Ave.
New York 20, N. Y.

STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Cutting Tools, Precision

BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 8, Rhode Island

Cylinder Blocks

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Mich.

Cylinder Boring Bars

VAN NORMAN CO.
Springfield 7, Mass.

Cylinder Heads

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Mich.

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

Cylinder Liners

See also "Liners"; "Diesel Cylinders"; "Centrifugally Cast Cylinder Liners".

CENTRIFUGAL FOUNDRY CO.
Muskegon, Mich.

JANNEY CYLINDER COMPANY
7425 State Road
Holmesburg, Philadelphia 36, Pa.

KOPPERS COMPANY, INC.
METAL PRODUCTS DIVISION
Bush & Hamburg Sts.
P.O.B. 626
Baltimore 3, Md.

SEALED POWER CORP.
Muskegon 61, Michigan

Cylinder Oils

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma

Cylinder Repairs

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Cylinder Sleeves

JANNEY CYLINDER COMPANY
7425 State Road
Holmesburg, Philadelphia 36, Pa.

Cylinders, Bored & Finished

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

Dampers, Torsional Vibration

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Indiana

Detergents

LUBAL, INC.
375 W. Rich St.
Columbus 8, Ohio

STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

Detonation Indicator

ELECTRO PRODUCTS LABORATORIES INC.
4501 N. Ravenswood Ave.
Chicago 40, Ill.

Development, Diesel Engine

LANOVA CORP.
38-15 30th Street
Long Island City 1, N. Y.

Dew Point Meters

ILLINOIS TESTING LABORATORIES, INC.
420 No. La Salle St.
Chicago 10, Ill.

Diesel Buses

MACK MFG. CORP.
Empire State Bldg.
New York 16, N. Y.

Diesel Engine Lubricating Oil

See also "Lubricating Oils".

STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.

THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

Diesel Engine Testing Equipment

BENNETT-FERAGEN, INC.
1005 So. Lafayette Blvd.
South Bend, Indiana

Diesel Engines, New

See also "Engines, Diesel, New".

CROFTON DIESEL ENGINE CO.
Ft. of "G" St. on Fisherman's Wharf
San Diego 1, California

HARNISCHFEGER CORPORATION
DIESEL DIVISION
100 Lake St.
Port Washington, Wisconsin

HERCULES MOTORS CORP.
Canton 2, Ohio

A. G. SCHOONMAKER, INC.
50 Church Street
New York 7, N. Y.

Diesel Engines, Reconditioned

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

GRIFFIN EQUIPMENT CORP.
880 E. 141 St.
New York 54, N. Y.

HERCULES ELECTRIC MACHINERY & EQUIPMENT CO.
1442 E. Washington Blvd.
Los Angeles 21, California

A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.

WOLVERINE MOTOR WORKS INC.
42 Union Ave.
Bridgeport, Conn.

Diesel Fuel Oil

See also "Automotive Diesel Fuel"; "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Motor Fuels".

ALLIED OIL COMPANY, INC.
1700 Standard Bldg.
Cleveland 1, Ohio

SHELL OIL CO.
50 West 50th St.
New York 20, N. Y.

SHELL OIL CO.
100 Bush St.
San Francisco 6 Cal.

SINCLAIR REFINING CO.
630 5th Ave.
New York 20, N. Y.

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

STANDARD OIL CO. OF CALIF.
225 Bush Street
San Francisco 20, Calif.

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Diesel Fuel Oil Tar and Carbon Dispersing Agent

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio

MAXFAL CHEMICAL CO.
33 West 42nd St.
New York, N. Y.

Diesel Generating Sets

See also "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generator Systems"; "Emergency Lighting Plants"; "Generating Sets Electric"; "Packaged Generators". "Standby Electric Plants"; Portable Electric Plants".

ABOE INC.
Empire State Bldg.
New York 16, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BOLINDERS CO., INC.
33 Rector Street
New York 6, N. Y.

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

THE COOPER-BESSEMER CORP.
Mount Vernon, Ohio

CROFTON DIESEL ENGINE CO.
Ft. of "G" St. on Fisherman's Wharf
San Diego 1, California

DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, Calif.

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Ill.

GRIFFIN EQUIPMENT CORP.
880 E. 141 St.
New York 54, N. Y.

HERCULES ELECTRIC MACHINERY & EQUIPMENT CO.
1442 East Washington Blvd.
Los Angeles 21, California

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

INTERNATIONAL DIESEL ELECTRIC CO., INC.
13-02 44th Avenue
Long Island City 1, N. Y.

NORDBERG MFG. CO.
3073 South Chase Ave.
Milwaukee 7, Wisconsin

JOHN REINER & CO.
12-12 37th Ave.
Long Island City 1, N. Y.

A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.

WOLVERINE MOTOR WORKS INC.
42 Union Ave.
Bridgeport, Conn.

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

Diesel Locomotives

See also headings under "Locomotives".

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

Diesel Nozzle Testers

See also "Nozzle Testers".

AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.

AUTOMOTIVE PRODUCTS, INC.
1700 S. E. Grand Avenue
Portland 14, Oregon

KENT MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit, Michigan

Diesel Power Units

See also headings under "Portable" and "Power Units".

HERCULES MOTORS CORP.
Canton 2, Ohio

Diesel Pumping Units

See also "Pumping Units, Diesel".

JOHN REINER & CO.
12-12 37th Ave.
Long Island City 1, N. Y.

Diesel Railway Generating Sets

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisc.

Diesel Repairs

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

Diesel Schools

ADCOX SCHOOL
237 N. E. Broadway
Portland 12, Oregon

COMMERCIAL TRADES INSTITUTE
1400 Greenleaf
Chicago 26, Illinois

UTILITIES ENGINEERING INSTITUTE
DIESEL DIVISION
2521 Sheffield Avenue
Chicago 14, Ill.

Diesel Truck-Tractors

MACK MFG. CORP.
Empire State Bldg.
New York 16, N. Y.

Drilling Machine (Sensitive) Precision

ELECTRO-MECHANO CO.
264 E. Erie Street
Milwaukee 2, Wis.

Drills, Portable Electric

SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

Drives, Adjustable Speed

RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio

Drives, Chain

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8 Mich.

Drives, Fluid

LINK-BELT CO.
2045 West Hunting Park Ave.
Philadelphia 40, Pa.

Drives, Gearmotor

LINK-BELT CO.
2045 West Hunting Park Ave.
Philadelphia 40, Pa.

Drives, Magnetic, Adjustable-Speed

ELECTRIC MACHINERY MFG. CO.
1331 Tyler St., N. E.
Minneapolis 13, Minn.

Drives, V-Belt

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

Dry Batteries

See also "Batteries, Flashlight, Lantern, and Signal"

WILLARD STORAGE BATTERY CO.
246-286 E. 131st Street
Cleveland 1, Ohio

Dual Chain Engine Drives

MORSE CHAIN CO.
7601 Central Ave.
Detroit 8, Mich.

Dual Engine Chain Drives

See also "Chain, Dual Engine Drives".

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

MORSE CHAIN CO.
7601 Central Avenue
Detroit 8, Mich.

Dynamic Micrometer

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Ill.

Dynamometers

BENNETT-FERAGEN, INC.
1005 So. Lafayette Blvd.
South Bend, Indiana

Dynamometers and Prony Brakes

BENNETT-FERAGEN, INC.
1005 So. Lafayette Blvd.
South Bend, Indiana

GENERAL ELECTRIC CO.
One River Road
Schenectady 5, N. Y.

Electrical Connectors

SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, New York

Emergency Diesel Generator Systems

See also "Auxiliary Diesel Generator Sets"; "Diesel Generating Sets"; "Emergency Lighting Plants"; "Generating Set, Electric"; "Packaged Generators"; "Standby Electric Plants"; "Portable Electric Plants".

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Illinois

INTERNATIONAL DIESEL ELECTRIC CO., INC.
13-02 44th Avenue
Long Island City 1, N. Y.

A. C. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.

Emergency Lighting Plants

See also heading above.

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

GRIFFIN EQUIPMENT CORP.
880 E. 141 St.
New York 54, N. Y.

INTERNATIONAL DIESEL ELECTRIC CO., INC.
13-02 44th Avenue
Long Island City 1, N. Y.

JOHN REINER & CO.
12-12 37th Ave.
Long Island City 1, N. Y.

Engine Cooling System Cleaners

OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Engine Cooling System Rust Preventatives

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Engine Dynamometers

BENNETT-FERAGEN, INC.
1005 So. Lafayette Blvd.
South Bend, Indiana

Engine Overhaul Tools

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan

Engine Repair Stands

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan

Engines, Diesel New

See also "Diesel Engines, New".

AMERICAN LOCOMOTIVE CO.
Schenectady 5, New York

HERCULES MOTORS CORP.
Canton 2, Ohio

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Engines, Diesel, New, Used

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

COOPER-BESSEMER CORP.
Mount Vernon, Ohio

WOLVERINE MOTOR WORKS INC.
42 Union Ave.
Bridgeport, Conn.

Evaporators

See also "Coolers, Evaporative Type".

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Evaporators, Exhaust Gas

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Evaporators, Steam

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Exchangers, Heat

See also "Water Cooling Equipment" and headings under "Coolers" and "Heat Exchangers".

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

BROWN FINTUBE CO.
300 Huron Street
Elyria, Ohio

DAVIS ENGINEERING CORP.
1064 E. Grand Street
Elizabeth, N. J.

THE FLUOR CORP.
403 W. 8th St.
Los Angeles 22, Calif.

GENERAL ELECTRIC CO.
Schenectady 5, N. Y.
1 River Road

HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

THE TRANE CO.
La Crosse, Wisconsin

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

YOUNG RADIATOR CO.
Racine, Wisconsin

Exchangers, Heat, Materials for Cleaning

OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.

Exciters

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

Exhaust Gas Economizer

See also headings under "Boilers"; "Waste Heat Boilers".

BROWN FINTUBE CO.
300 Huron Street
Elyria, Ohio

Fans, Axial Flow

BUFFALO FORGE CO.
473 Broadway
Buffalo, N. Y.

Fans, Centrifugal

BUFFALO FORGE CO.
473 Broadway
Buffalo, N. Y.

Fans, Radiator Cooling

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Indiana

Fill Signals

SCULLY SIGNAL CO.
88 First St.
Cambridge, Mass.

Filtering Systems

ENGINE LIFE PRODUCTS CORP.
115 So. Granada Ave.
El Monte, California

Filters, Air

See also "Air Cleaners"; "Air Filters"; "Breather Caps", etc.

A. C. SPARK PLUG DIVN.
GENERAL MOTORS CORP.
Flint 2, Michigan

Filters, Air, Automatic Self-Cleaned

AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.

DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.

Filters, Air, Compressed

CHICAGO MANUFACTURING & DISTRIBUTING CO.
1932 W. 46th St.
Chicago 9, Ill.

COMMERCIAL FILTERS CORP.
18 W. Third St.
Boston 27, Mass.

Filters, Air, Dry Type

AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.

DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.

Filters, Air, Dry Type (Crankcase)

FRAM CORP.
Providence 16, Rhode Island

Filters, Air, Ejector, Pre-Cleaner

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.

Filters, Air, Intake

DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.

Filters, Air, Materials for Cleaning

AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.

OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.

Filters, Air, Oil Bath Type

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.

DONALDSON COMPANY, INC.
666 Pelham Blvd.
Saint Paul 4, Minn.

Filters, Air, Open-Screen Type

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.

Filters, Air, Panel Type

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.

DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.

FARR COMPANY
2615 Southwest Drive
Los Angeles 43, Calif.

Filters (Centrifugal) Lubricating Oil

THE DE LAVAL SEPARATOR CO.
165 Broadway
New York 6, N. Y.

Filters, Fuel Oil

See also "Oil Filters".

A. C. SPARK PLUG DIVN.
GENERAL MOTORS CORP.
Flint 2, Michigan

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.

BRIGGS FILTRATION COMPANY
Washington 16, D. C.

C. A. V. LIMITED
Acton, London, W. 3, England

COMMERCIAL FILTERS CORP.
18 West Third Street
Boston 27, Mass.

W. J. CONNELL CO.
121 Brookline Ave.
Boston, Mass.

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.

ENGINE LIFE PRODUCTS CORP.
115 So. Granada Ave.
El Monte, Calif.

FRAM CORP.
Providence 16, Rhode Island

THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.

LUBER-FINER, INC.
2514 S. Grand Ave.
Los Angeles 7, Calif.

WILLIAM W. NUGENT & CO., INC.
410 No. Hermitage Ave.
Chicago 22, Ill.

PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.

UNITED STATES HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
219 Lamson Street
Syracuse 6, N. Y.

E. A. WILDERMUTH
1102 Atlantic Ave.
Brooklyn 16, N. Y.

WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, Calif.

Filters, Gasoline

DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.

FRAM CORP.
Providence 16, R. I.

Filters, Lubricating Oil

See also "Oil Filters".

A. C. SPARK PLUG DIVN.
GENERAL MOTORS CORP.
Flint 2, Michigan

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.

COMMERCIAL FILTERS CORP.
18 West Third Street
Boston 27, Mass.

W. J. CONNELL CO.
121 Brookline Ave.
Boston, Mass.

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.

ENGINE LIFE PRODUCTS CORP.
115 So. Granada Ave.
El Monte, Calif.

FRAM CORP.
Providence 16, Rhode Island

THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.

LUBER-FINER, INC.
2514 S. Grand Ave.
Los Angeles 7, Calif.

MICHIANA PRODUCTS CORP.
Michigan City, Indiana

WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.

PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.

U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
219 Lamson Street
Syracuse 6, N. Y.

WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, Calif.

Filters, Lubricating Oil, Magnetic

WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, Calif.

Filters, Silencer, Dry Type

DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.

Filters Silencer, Oil Bath Type

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.

Fire Extinguishers, Dry Chemical Type

GUSTIN-BACON MFG. CO.
Kansas City 7, Mo.

Fittings, Hose, Detachable

AERO-COUPLING CORP.
3015 Winona Ave.
Burbank, Calif.
AEROQUIP CORP.
Jackson, Michigan

Flange Lubricators, Graphite

NATIONAL CARBON CO.
DIVISION OF UNION CARBIDE & CARBON CORP.
30 East 42nd Street
New York 17, N. Y.

Flexible Connections, Stainless Steel

See also headings under "Hose" and "Tubing".

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

CHICAGO METAL HOSE CORP.
1315 So. 3rd Ave.
Maywood, Illinois

PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7217 Powers Lane
Philadelphia 42, Pa.

ZALLEA BROS.
Taylor & Locust Street
Wilmington, Del.

Flexible Exhaust Connections

See also headings under "Hose" and "Tubing".

ALLIED METAL HOSE CO.
37-46 Ninth Street
Long Island City 1, N. Y.
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO. INC.
123 W. 64th St.
New York 23, N. Y.
CHICAGO METAL HOSE CORP.
1315 So. 3rd Ave.
Maywood, Illinois
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7217 Powers Lane
Philadelphia 42, Pa.
ZALLEA BROS.
Taylor & Locust Street
Wilmington, Del.

Flexible Metal Hose, Fuel Oil, Lubricating Oil, Compressed Air & Water

See also headings under "Hose" and "Tubing".

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 West 64th Street
New York 23, N. Y.
CHICAGO METAL HOSE CORP.
1315 So. 3rd Ave.
Maywood, Illinois
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7217 Powers Lane
Philadelphia 48, Pa.

Flexible Metallic Hose

See also "Hose, Flexible, Metallic".

ALLIED METAL HOSE CO.
37-46 9th Street
Long Island City 1, N. Y.
ZALLEA BROS.
Taylor & Locust Streets
Wilmington, Del.

Flow Meters

BENNETT-FERAGEN, INC.
1005 So. Lafayette Blvd.
South Bend, Indiana

Fluid Drive

AMERICAN BLOWER CORP.
Detroit 32, Michigan
LINK-BELT CO.
2045 West Hunting Park Ave.
Philadelphia, Pa.

Forgings, Drop

WYMAN-GORDON COMPANY
GENERAL OFFICE & WORKS, Worcester, Mass.
(INGALLS-SHEPARD DIVISION, Harvey, Ill.)
(GRAFTON DIVISION, N. Grafton, Mass.)

Forgings, Steel

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

Frequency Controls

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa

Fuel Injection Systems, Repair & Service

See also "Injection Systems, Service"; "Service, Injection System".

DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia
HANCOCK MACHINE CO.
300 Walnut St.
Findlay, Ohio

Fuel Oil Additives

See also "Additives"; "Fuel Oil Treatment, Diesel".

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio
LUBAID CO.
3270 S. Third St.
Milwaukee 7, Wis.

Fuel Oil, Diesel

See also "Automotive Diesel Fuel"; "Oils, Diesel Fuels"; "Diesel Fuel Oil".

CITIES SERVICE OIL CO.
Sixty Wall Tower
New York 5, N. Y.
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Okla.
THE PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.
SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.
SINCLAIR REFINING CO.
630 Fifth Ave.
New York 20, N. Y.
STANDARD OIL CO. (Indiana)
910 South Michigan Ave.
Chicago 80, Illinois
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Fuel Oil Tar and Carbon Dispersing Agent

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio
MAXFAL CHEMICAL CO.
33 West 42nd Street
New York, N. Y.

Fuel Oil Treatment, Diesel

See also "Additives"; "Fuel Oil Additives".

GAMLEN CHEMICAL CO.
665 Newark Ave.
Jersey City, N. J.
LUBAID CO.
3270 S. Third St.
Milwaukee 7, Wisconsin
LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio
PETROLEUM SOLVENTS CORP.
331 Madison Avenue
New York 17, N. Y.
WILKENING MFG. CO. (PEDRICK)
2000 S. 71st Street
Philadelphia 42, Pa.

Gages, Air Pressure

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Ave.
Chicago 40, Ill.
ROCHESTER MFG. CO., INC.
103 Rockwood St.
Rochester 10, N. Y.

Gages, Draft, Portable Indicating

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
ROCHESTER MFG. CO., INC.
103 Rockwood St.
Rochester 10, N. Y.

Gages, Fuel

KING ENGINEERING CORP.
415 Detroit St.
Ann Arbor, Michigan
THE LIQUIDOMETER CORP.
41-03 36th Street
Long Island City 1, N. Y.
ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Gages, Liquid Level

KING ENGINEERING CORP.
415 Detroit St.
Ann Arbor, Michigan

Gages, Oil Pressure

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Ill.

ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Gages, Tank Contents

KING ENGINEERING CORP.
415 Detroit St.
Ann Arbor, Michigan
THE LIQUIDOMETER CORP.
41-03 36th Street
Long Island City 1, N. Y.
LIQUIDEPTH INDICATORS, INC.
9 Star Square
Long Island City 1, N. Y.
ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Gages Temperature

ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Gages, Vacuum

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan
ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester, N Y.

Gaskets

THE FITZGERALD MFG. CO.
Torrington, Conn.

VICTOR MFG. & GASKET CO.
5750 West Roosevelt Road
Chicago 50, Ill.

Gaskets, Asbestos

THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MFG. & GASKET CO.
5750 West Roosevelt Road
Chicago 50, Illinois

Gaskets, Cork

THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MFG. & GASKET CO.
5750 West Roosevelt Road
Chicago 50, Illinois

Gaskets, Fibrous

THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Metallic

THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MFG. & GASKET CO.
5750 West Roosevelt Road
Chicago 50, Illinois

Gaskets, Oil and Water

THE FITZGERALD MFG. CO.
Torrington, Conn.

Gearmotors

LINK-BELT COMPANY
2045 West Hunting Park Ave.
Philadelphia 40, Pa.

Gears, Cast

LINK-BELT CO.
2045 West Hunting Park Ave.
Philadelphia 40, Pa.

Gears, Cut

LINK-BELT CO.
2045 West Hunting Park Ave.
Philadelphia 40, Pa.
WESTERN GEAR WORKS
P. O. Box 192
Lynwood, California

Gears, Double Enveloping

CONE-DRIVE GEARS
DIVISION OF MICHIGAN TOOL CO.
7171 E. McNichols Road
Detroit 12, Michigan

Gears, Reduction

CONE-DRIVE GEARS
DIVISION OF MICHIGAN TOOL CO.
7171 E. McNichols Road
Detroit 12, Michigan
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, N. J.
LINK-BELT CO.
2045 West Hunting Park Ave.
Philadelphia 40, Pa.
WESTERN GEAR WORKS
P. O. Box 192
Lynwood, California

Generating Sets, Electric

See also "Diesel Generator Sets"; "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generating Systems"; "Emergency Lighting Plants"; "Packaged Generators"; "Standby Electric Plants"; "Portable Electric Plants".

DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
INTERNATIONAL DIESEL ELECTRIC CO., INC.
13-02 44th Avenue
Long Island City 1, N. Y.
WOLVERINE MOTOR WORKS INC.
42 Union Ave.
Bridgeport, Conn.

Generators, A. C.

See also "Alternators".

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio
DELCO PRODUCTS DIVN.
GENERAL MOTORS CORP.
329 E. First St.
Dayton 1, Ohio
ELECTRIC MACHINERY MFG. CO.
1331 Tyler St., N.E.
Minneapolis 13, Minn.
FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
THE LEECE-NEVILLE CO.
5109 Hamilton Avenue
Cleveland 14, Ohio

Generators, Charging

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
THE LEECE-NEVILLE CO.
5109 Hamilton Ave.
Cleveland 14, Ohio

Generators, D. C.

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio
DELCO PRODUCTS DIV.
GENERAL MOTORS CORP.
329 E. First St.
Dayton 1, Ohio
DELCO-REMY DIV.
GENERAL MOTORS CORP.
Anderson, Indiana
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Illinois
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
THE LEECE-NEVILLE CO.
5109 Hamilton Avenue
Cleveland 14, Ohio
SAFETY CAR HEATING AND LIGHTING CO., INC.
P. O. Box 904
New Haven 4, Conn.

Generators, Diesel Engine Driven

CONSOLIDATED DIESEL ELECTRIC CORP.
Ludlow & Canal Streets
Stamford, Conn.

Generators, Engine Driven

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 West 106th St.
Cleveland 11, Ohio
CONSOLIDATED DIESEL ELECTRIC CORP.
Ludlow & Canal Streets
Stamford, Conn.
DELCO PRODUCTS DIVN.
GENERAL MOTORS CORP.
329 E. First St.
Dayton 1, Ohio
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street, N. E.
Minneapolis 13, Minn.
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
HERCULES ELECTRIC MACHINERY & EQUIPMENT CO.
1442 E. Washington Blvd.
Los Angeles 21, California
D. W. ONAN & SONS, INC.
University Ave. S. E. at 25th
Minneapolis 14, Minn.
WOLVERINE MOTOR WORKS INC.
42 Union Ave.
Bridgeport, Conn.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

Governors, Centrifugal

C. A. V. LIMITED
Acton, London, W. 3, England
PICKERING GOVERNOR CO. (CHAMPLAIN)
88 Llewllyn Avenue
Bloomfield, N. J.
PIERCE GOVERNOR CO.
1625 Ohio Ave.
Anderson, Indiana

Governors, Hydraulic

PICKERING GOVERNOR CO. (CHAMPLAIN)
88 Llewllyn Avenue
Bloomfield, N. J.
PIERCE GOVERNOR CO.
1625 Ohio Ave.
Anderson, Indiana
WOODWARD GOVERNOR CO.
Rockford, Illinois

Governors, Overspeed, Engine Shut-Off

PICKERING GOVERNOR CO. (CHAMPLAIN)
88 Llewllyn Avenue
Bloomfield, N. J.
PIERCE GOVERNOR CO.
1625 Ohio Ave.
Anderson, Indiana
SYNCHRO START PRODS., INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

Greases

See also "Lubricants"; "Industrial Greases."

CITIES SERVICE OIL CO.
Sixty Wall Tower
New York 5, N. Y.

D-A LUBRICANT CO., INC.
1311 West 29th Street
Indianapolis, Indiana

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Okla.

SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.

SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.

SINCLAIR REFINING CO.
630 Fifth Ave.
New York 20, N. Y.

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

STANDARD OIL CO. (Indiana)
910 South Michigan Ave.
Chicago, Illinois

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Grey Iron and Steel Castings

See also "Castings, Grey Iron (Centrifugal)".

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Michigan

Grinders

BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 8, R. I.

Hangers, Ball-Bearing

LINK-BELT CO.
519 North Holmes Ave.
Indianapolis 6, Indiana

Hardened and Ground Parts

THE CHICAGO SCREW CO.
2701 Washington Blvd.
Bellwood, Ill.

Hardness Testers

LOUIS C. EITZEN CO.
17 W. 60th Street
New York 23, N. Y.

Heat Exchanger Cleaners

OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.

Heat Exchangers, Air Cooled

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.

BROWN FINTUBE CO.
300 Huron Street
Elyria, Ohio

ENGINEERING CONTROLS CO.
2835 E. 11th St.
Los Angeles 23, Calif.

THE FLUOR CORP.
403 W. 8th St.
Los Angeles 22, Calif.

HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport 10, N. Y.

THE MARLEY CO., INC.
Fairfax and Marley Roads
Kansas City 15, Kansas

J. F. PRITCHARD & CO.
908 Grand Ave.
Kansas City 6, Missouri

THE TRANE CO.
La Crosse, Wisconsin

Heat Exchangers, Industrial

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

Heat Exchangers, Oil & Water

BROWN FINTUBE CO.
300 Huron Street
Elyria, Ohio

J. F. PRITCHARD & CO.
908 Grand Ave.
Kansas City 6, Missouri

Heat Exchangers, Oil and Water Cooling

See also headings under "Coolers"; "Exchangers, Heat"; "Water Cooling Equipment"; etc.

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

ENGINEERING CONTROLS CO.
2835 E. 11th St.
Los Angeles 23, Calif.

THE FLUOR CORP.
403 W. 8th St.
Los Angeles 22, Calif.

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.

THE ROME-TURNEY RADIATOR CO.
Rome, N. Y.

ROSS HEATER & MFG. CO., INC.
1405 West Ave.
Buffalo 13, N. Y.

STRUTHERS-WELLS CORP.
Warren, Pennsylvania

THE TRANE CO.
La Crosse, Wisconsin

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

YOUNG RADIATOR CO.
Racine, Wisconsin

Heaters

See also "Combustion Heaters".

BROWN FINTUBE CO.
300 Huron Street
Elyria, Ohio

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

HUNTER MANUFACTURING CO.
1550 East 17th St.
Cleveland 14, Ohio

ROSS HEATER & MFG. CO., INC.
1405 West Ave.
Buffalo 13, N. Y.

Heaters, Cab and Space

BROWN FINTUBE CO.
300 Huron Street
Elyria, Ohio

HUNTER MANUFACTURING CO.
1550 East 17th St.
Cleveland 14, Ohio

YOUNG RADIATOR CO.
Racine, Wisc.

Heaters, Coolant

BROWN FINTUBE CO.
300 Huron Street
Elyria, Ohio

Heat Treating, Electric Furnace

THE OHIO CRANKSHAFT CO.
3800 Harvard Avenue
Cleveland, Ohio

Honing Tools

AMMCO TOOLS, INC.
2100 Commonwealth Ave.
North Chicago, Illinois

MICROMATIC HONE CORP.
8100 Schoolcraft
Detroit 4, Michigan

Horizontal Head Grinders

VAN NORMAN CO.
Springfield 7, Mass.

Hose, Flexible

AERO-COUPLING CORP.
3015 Winona Avenue
Burbank, Calif.

AEROQUIP CORP.
Jackson, Michigan

Hose, Flexible Assemblies

See also headings under "Flexible" and "Tubing".

AERO-COUPLING CORP.
3015 Winona Avenue
Burbank, Calif.

AEROQUIP CORP.
Jackson, Michigan

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

ATLANTIC METAL HOSE CO. INC.
123 W. 64th Street
New York 23, N. Y.

Hose, Flexible Metallic

See also headings under "Flexible" and "Tubing"; "Flexible Metallic Hose".

ALLIED METAL HOSE CO.
37-46 9th Street
Long Island City 1, N. Y.

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

ATLANTIC METAL HOSE CO. INC.
123 W. 64th St.
New York 23, N. Y.

CHICAGO METAL HOSE CORP.
1315 So. 3rd Ave.
Maywood, Illinois

Hose, Metal For Steam, Oil, Compressed Air

See also headings under "Flexible Hose" and "Tubing".

ALLIED METAL HOSE CO.
37-46 9th Street
Long Island City 1, N. Y.

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

ATLANTIC METAL HOSE CO. INC.
123 W. 64th Street
New York 23, N. Y.

CHICAGO METAL HOSE CORP.
1315 So. 3rd Ave.
Maywood, Illinois

Hoses and Hose Assemblies, Non-Metallic

See also headings under "Flexible" and "Tubing".

RESISTOFLEX CORP.
Belleville 9, New Jersey

Hydraulic Couplings

See also "Couplings, Hydraulic"

AMERICAN BLOWER CORP.
Detroit 32, Michigan

Hydraulic Drives

LINK-BELT CO.
2045 W. Hunting Park Ave.
Philadelphia 40, Pa.

Hydraulic Fluids

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.

THE PURE OIL CO.
35 E. Wacker Drive
Chicago 1, Ill.

SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.

SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Hydraulic Torque Converters

WESTERN GEAR WORKS
P. O. Box 192
Lynwood, California

Impact Wrenches

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.

Indicators, Carbon Dioxide

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

Indicators, Card-Drawing Type

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

Indicators, Diesel Engine

See also "Compression Testers, Diesel Engine", and other headings under "Indicators".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Ave.
Chicago 40, Illinois

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

Indicators, Direct Reading, Maximum Pressure

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park 48, Ill.

Indicators, Oxygen

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

Indicators, Pressure Time

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

ELECTRO PRODUCTS LABORATORIES, INC.
4501 No. Ravenswood Ave.
Chicago 40, Illinois

KENT MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Indicators, Sight Flow

WILLIAM W. NUGENT & CO.
410 N. Hermitage Ave.
Chicago 22, Ill.

Indicators, Speed

BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 8, Rhode Island

Induction Heating Equipment

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

THE OHIO CRANKSHAFT CO.
3800 Harvard Avenue
Cleveland, Ohio

Industrial Greases

See also "Greases," "Lubricants."

THE TEXAS CO.
135 E. 42 St.
New York 17, N. Y.

Industrial Oils

See also headings under "Lubricants" and "Greases".

STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.

THE TEXAS CO.
135 E. 42 St.
New York 17, N. Y.

Industrial Wheel Tractors, 4-Cycle, High Speed, 38½ to 52 Engine Hp.

INTERNATIONAL HARVESTER CO.
180 N. Michigan Ave.
Chicago 1, Ill.

Injection Systems, Fuel

AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.

C. A. V. LIMITED
Acton, London, W.3., England

W. J. CONNELL CO.
121 Brookline Ave.
Boston, Mass.

SCINTILLA MAGNETO DIVN.
BENDIX AVIATION CORP.
Sidney, N. Y.

Injection Systems, Fuel Injector

C. A. V. LIMITED
Acton, London, W.3., England

DIESEL ENGINEERING & MFG. CORP.
200 N. Laflin St.
Chicago 7, Ill.

SCINTILLA MAGNETO DIVN.
BENDIX AVIATION CORP.
Sidney, N. Y.

Injection Systems, Fuel, Mail Order Exchange

HANCOCK MACHINE CO.
300 Walnut St.
Findlay, Ohio

Injection Systems, Service

See also "Fuel Injection Systems, Repair & Service"; Service, Injection System".

W. J. CONNELL CO.
121 Brookline Ave.
Boston, Mass.

DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

GRIFFIN EQUIPMENT CORP.
880 E. 141 St.
New York 54, N. Y.

HANCOCK MACHINE CO.
300 Walnut St.
Findlay, Ohio

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Mich.

E. A. WILDERMUTH
1102 Atlantic Avenue
Brooklyn 16, N. Y.

Injector Test Stand

AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand Ave.
Portland 14,, Oregon

BACHRACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Inspection, Manufacture and Overhaul, for Defects

MAGNAFLUX CORP.
5900 Northwest Highway
Chicago 31, Illinois

Instrument Panels, Engine

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Ill.

Insulation, Pipe, Flexible

GUSTIN-BACON MFG. CO.
Kansas City 7, Mo.

Intake Silencers—Cleaners, Dry Type

See also "Silencers, Intake".

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 4, Minnesota

Laboratory, Diesel Engine

LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

Lapping Tools

AMERICAN LAP CO.
3716 Fischer
Detroit 14, Mich.

Liner Plating, Porous Chrome

SPAR-TAN ENGINEERING COMPANY
Western Licensee—Van der Horst Corp.
2445 Enterprise St.
Los Angeles 21, California

VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, New York

Liners, Diesel Cylinder

See also "Cylinder Liners".

HUNT-SPILLER MFG. CO.
383 Dorchester Ave.
Boston 27, Mass.

Lock Nuts

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.

Locomotives, Diesel

See also headings under "Diesel Locomotives".

ABOE, INC.
Empire State Bldg.
New York 16, N. Y.

DAVENPORT-BESLER CORP.
Davenport Locomotive Works
Davenport, Iowa
INTERNATIONAL DIESEL LOCOMOTIVE CORP.
13-02 44th Avenue
Long Island City 1, N. Y.

Locomotives, Diesel-Electric

See heading above.

AMERICAN LOCOMOTIVE CO.
Schenectady 5, N. Y.
DAVENPORT-BESLER CORP.
Davenport Locomotive Works
Davenport, Iowa
ELECTRO-MOTIVE DIVN.
GENERAL MOTORS CORP.
La Grange, Illinois
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Illinois
GENERAL ELECTRIC CO.
One River Road
Schenectady 5, N. Y.

Locomotives, Diesel Mechanical

See also headings above.

INTERNATIONAL DIESEL LOCOMOTIVE CORP.
13-02 44th Avenue
Long Island City 1, N. Y.

Locomotives, Diesel Mine

INTERNATIONAL DIESEL LOCOMOTIVE CORP.
13-02 44th Avenue
Long Island City 1, N. Y.

Lubricants

See also "Industrial Oils", "Greases", "Industrial Greases"

D-A LUBRICANT CO., INC.
1311 West 29th Street
Indianapolis, Indiana
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma
SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.
SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.
SINCLAIR REFINING CO.
630 Fifth Ave.
New York 20, N. Y.
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Lubricating Compound

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Lubricating Oil Compound

STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

Lubricating Oils

See also "Diesel Engine Lubricating Oil".

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.
D-A LUBRICANT CO., INC.
1311 West 29th Street
Indianapolis, Indiana
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
LION OIL CO.
El Dorado, Arkansas
MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Okla.
THE PURE OIL CO.
35 East Wacker Drive
Chicago 1, Illinois
SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.
SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.
SINCLAIR REFINING CO.
630 Fifth Ave.
New York 20, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.
STANDARD OIL CO. (INDIANA)
910 South Michigan Ave.
Chicago, Illinois
THE TEXAS CO.
135 E. 42nd St.
New York 17, N. Y.
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Lubricators

MADISON KIPP CORP.
Madison, Wis.

Lubricators, Diesel Traction Motor Suspension Bearing

MILLER-FELPAX CORP.
51 Walnut St.
Winona, Minn.

Lubricators, Felt Wick

MILLER-FELPAX CORP.
51 Walnut St.
Winona, Minn.

Lubricators, Force Feed

MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

Lubricators, Mechanical

See also "Mechanical Force Feed Oil Systems".

MANZEL DIV. OF FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.
MC CORD CORPORATION
2587 E. Grand Blvd.
Detroit 11, Michigan

Lubricators, Sight Feed

MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

Machine Tools

VAN NORMAN CO.
Springfield 7, Mass.

Machine Tools, Precision

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 8, Rhode Island

Machine Tools, Precision Honing

MICROMATIC HONE CORP.
8100 Schoolcraft
Detroit 4, Michigan

Magnets

AUTOMATIC SWITCH COMPANY
391 Lakeside Ave.
Orange, N. J.

Manifolds

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

Marine Diesel—Front End Gear Driven Accessories

HARNISCHFEGER CORP.
DIESEL DIVISION
100 Lake Street
Port Washington, Wisconsin

Marine Engines

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, Calif.

Marine Reverse & Reduction Gears

THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.
WESTERN GEAR WORKS
P. O. Box 192
Lynwood, California

Mechanical Force Feed Oil Systems

See also "Lubricators, Mechanical".

MADISON KIPP CORP.
Madison, Wisconsin

Metal Spraying & Finishing

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

Meters, Elapsed Time

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa

Meters, Electrical Indicating

See also "Ammeters"; "Volt-Ammeters, Clamp-On Type".

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

Meters, Engine Hour

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa

Meters, Fuel Oil

NEPTUNE METER CO.
50 West 50th St.
New York 20, N. Y.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

Milling Machines

BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 8, Rhode Island

Motor Fuels

See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Oil, Diesel Fuel".

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Motor-Generator Sets

SAFETY CAR HEATING AND LIGHTING CO., INC.
P. O. Box 904
New Haven 4, Conn.

Motor Generator Sets—Electroplating, Low Voltage

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

Motors, Air

THE LEECE-NEVILLE CO.
5109 Hamilton Avenue
Cleveland 14, Ohio

Motors, Electric, A. C.

DELCO PRODUCTS DIVISION
GENERAL MOTORS CORP.
329 East First Street
Dayton 1, Ohio

Motors, Electric, A. C. & D. C.

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio

Motors, Gear

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
LINK-BELT CO.
2045 West Hunting Park Ave.
Philadelphia 40, Pa.
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio

Mufflers, Intake & Exhaust

See also headings under "Silencers".

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 4, Minn.
THE FLUOR CORP.
403 West Eighth St.
LosAngeles 22, Calif.
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Mufflers, Spark Arresting

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Nozzle Cleaning Kits

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

Nozzles, Spray, Water Cooled

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORP.
Sidney, N. Y.

Nozzles, Spray, Water Cooling

See also "Spray Nozzles, Water".

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.
BUFFALO FORGE CO.
473 Broadway
Buffalo, N. Y.
LNK-BELT CO.
300 W. Pershing Road
Chicago 9, Ill.

Nozzle Testers, Diesel Engine

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park 48, Ill.

Oil Conditioners

See also headings under "Reclaimers"; "Purifiers, "Conditioners", etc.

U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVN.
219 Lamson St.
Syracuse 6, N. Y.

Oil Coolers, Cleaners

OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.

Oil Coolers, Lubricating

See also headings under "Coolers"; and "Heat Exchangers"; "Exchangers, Heat".

DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth, N. J.
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
ROSS HEATER & MFG. CO., INC.
1405 West Avenue
Buffalo 13, N. Y.
STRUTHERS-WELLS CORP.
Warren, Pa.
THE TRANE CO.
La Crosse, Wisconsin

Oil Filters

See also headings under "Filters".

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.
FRAM CORP.
Providence 16, R. I.
HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Ave.
Lebanon, Indiana
MICHIANA PRODS. CORP.
Michigan City, Indiana
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
219 Lamson Street
Syracuse 6, N. Y.
WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, Calif.

Oil Heaters

DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth, N. J.
ROSS HEATER & MFG. CO., INC.
1405 West Avenue
Buffalo 13, N. Y.

Oiling Systems, Pressure & Gravity Types

WILLIAM W. NUGENT & CO.
410 N. Hermitage Ave.
Chicago 22, Ill.

Oil Pumps

MADISON KIPP CORP.
Madison, Wisconsin

Oil Purification Systems, Centrifugal

See also headings under "Centrifugal Purifiers".

THE DE LAVAL SEPARATOR CO.
165 Broadway
New York 6, N. Y.

Oil Purification Systems, Filtering Earth Type

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Avenue
Lebanon, Indiana
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
219 Lamson Street
Syracuse 6, N. Y.

Oil Purification Systems Pressure and Gravity Types

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.
WM. W. NUGENT & CO., INC.
410 North Hermitage Ave.
Chicago 22, Illinois
WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, Calif.

Oil Reclamation Systems

GUSTIN-BACON MFG. CO.
Kansas City 7, Mo.
WILLIAM W. NUGENT & CO.
410 N. Hermitage Ave.
Chicago 22, Ill.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
219 Lamson Street
Syracuse 6, N. Y.

Oil Re-refiners

WALTER KIDDE & CO., INC.
YOUNGSTOWN MILLER DIVISION
173 Main St.
Belleville 9, New Jersey

Oil Seals & Grease Retainers

THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MFG. & GASKET CO
5750 West Roosevelt Road
Chicago, Illinois

Oil Separators

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

Oil Testing Equipment (Engine Room Kits)

THE GERIN CORP.
P. O. Box 653
Red Bank, N. J.

Oils, Diesel Fuel

See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Motor Fuels".

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma
SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.
SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Oils, Penetrating

PETROLEUM SOLVENTS CORP.
331 Madison Avenue
New York 17, N. Y.

Packaged Generators

See also "Diesel Generating Sets"; "Generating Sets Electric"; Auxiliary Diesel Generating Sets"; "Emergency Diesel Generator Systems"; "Emergency Lighting Plants". "Standby Electric Plants"; "Portable Electric Plants".

GENERAL ELECTRIC CO.
One River Road
Schenectady 5, N. Y.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

Packing, Oil Wiper

C. LEE COOK MFG. CO.
76 Beaver Street
New York, N. Y.
DOUBLE SEAL RING CO.
2065 Montgomery St.
Fort Worth, Texas

Packing, Rod Metallic

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.
DOUBLE SEAL RING CO.
2065 Montgomery St.
Fort Worth, Texas

Packing, Sheet

VICTOR MFG. & GASKET CO.
5750 W. Roosevelt Road
Chicago, Ill.

Packing Sheets, Oil & Water

THE FITZGERALD MFG. CO.
Torrington, Conn.

Pillow Blocks, Anti-Friction

SKF INDUSTRIES, INC.
Front St. & Erie Ave.
P.O. Box 6731
Philadelphia 32, Pa.

Pillow Blocks, Babbitted and Bronze-Bushed-Bearings

LINK-BELT CO.
2410 West 18th St.
Chicago 8, Ill.

Pillow Blocks, Ball & Roller Bearing

LINK-BELT CO.
519 N. Holmes Ave.
Indianapolis 6, Ind.

Pipe Fittings, Compression

WM. W. NUGENT & CO.
410 N. Hermitage Ave.
Chicago 22, Ill.

Piston Expanding Machines

WAUSAU MOTOR PARTS CO.
1005 Harrison Blvd.
Wausau, Wisconsin

Piston and Packing Rings, Carbon and Graphite

NATIONAL CARBON CO.
DIVISION OF UNION CARBIDE & CARBON CORP.
30 East 42nd Street
New York 17, N. Y.

Piston Grinders

VAN NORMAN CO.
Springfield 7, Mass.

Piston Pins

BURGESS-NORTON MFG. CO.
Geneva, Ill.
SEALED POWER CORP.
Muskegon 61, Michigan

Piston Ring Pot Castings

CENTRIFUGAL FOUNDRY CO.
Muskegon, Michigan

Piston Ring Removers

DOUBLE SEAL RING CO.
2065 Montgomery St.
Fort Worth, Texas

Piston Rings

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.
DOUBLE SEAL RING CO.
2065 Montgomery St.
Fort Worth, Texas
HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.
KOPPERS CO., INC.
Metal Products Div.
Bush and Hamburg Sts.
P.O.B. 626
Baltimore 3, Md.
SEALED POWER CORP.
Muskegon 61, Michigan
WAUSAU MOTOR PARTS CO.
1005 Harrison Blvd.
Wausau, Wisconsin
WILKENING MFG. CO.
2000 S. 71st St.
Philadelphia 42, Pa.

Piston Rings, Oil Control

C. LEE COOK MFG. CO.
76 Beaver Street
New York, N. Y.

Piston Rings, Sealing

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.
DOUBLE SEAL RING CO.
2065 Montgomery St.
Fort Worth, Texas
WILKENING MFG. CO.
2000 S. 71st St.
Philadelphia 42, Pa.

Pistons

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Michigan

Pistons, Aluminum Alloy

SEALED POWER CORP.
Muskegon 61, Michigan

Pistons, Cast Iron

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

Pistons, Material for Cleaning

OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.

Planimeter, Indicator Card

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

Plating, Porous Chrome

SPAR-TAN ENGINEERING CO.
Western Licensee—Van der Horst Corp.
2445 Enterprise St.
Los Angeles 21, Calif.
VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, New York

Portable Contractors' Power Units

See also "Diesel Power Units" and other headings this page.

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
HARNISCHFEGER CORP.
DIESEL DIVISION
100 Lake St.
Port Washington, Wisconsin
JOHN REINER & CO.
12-12 37th Ave.
Long Island City 1, N. Y.
WAUKESHA MOTOR CO.
P.O. Box 379
Waukesha, Wisconsin

Portable Electric Plants

See also "Diesel Generating Sets"; "Generating Sets, Electric"; "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generator Systems"; "Emergency Lighting Plants"; "Packaged Generators"; "Standby Electric Plants".

D. W. ONAN & SONS, INC.
University Ave., S. E. at 25th
Minneapolis 14, Minn.

Power Plants, Automatically Controlled

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
WAUKESHA MOTOR CO.
P.O. Box 379
Waukesha, Wisconsin

Power Take-Off Units

LINK-BELT CO.
300 W. Pershing Road
Chicago 9, Ill.
ROCKFORD CLUTCH DIV.
BORG-WARNER CORP.
1301 18th Ave.
Rockford, Ill.
THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.

Power Units

See also "Diesel Power Units" and other headings this page.

ABOE, INC.
Empire State Bldg.
New York 16, N. Y.
CROFTON DIESEL ENGINE CO.
Ft. of "G" St. on Fisherman's Wharf
San Diego 1, California
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
WAUKESHA MOTOR CO.
P.O. Box 379
Waukesha, Wisconsin

Power Units, Diesel

See also "Diesel Power Units" and other headings this page.

HERCULES MOTORS CORP.
Canton 2, Ohio

Presses, Electric, Hydraulic Air Operated

LEMPCO PRODUCTS, INC.
5490 Dunham Rd.
Bedford, Ohio

Precision Measuring Devices

BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 8, R. I.

Pressuregraph

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood
Chicago 40, Illinois

Pressure Plate Grinders

VAN NORMAN CO.
Springfield 7, Mass.

Pressure Switches

UNITED ELECTRIC CONTROLS CO.
85 School St.
Watertown 72, Mass.

Pulsation Dampeners

THE FLUOR CORP.
403 W. Eighth St.
Los Angeles 22, Calif.

Pumping Units, Diesel

See also "Diesel Pumping Units".

ABOE, INC.
Empire State Bldg.
New York 16, N. Y.
GRIFFIN EQUIPMENT CORP.
880 E. 141st St.
New York 54, N. Y.
INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

Pumps, Automatic Reversing

BROWN & SHARPE MFG. CO.
235 Promenade St.
Providence 8, R. I.

Pumps, Centrifugal

BROWN & SHARPE MFG. CO.
235 Promenade St.
Providence 8, R. I.
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, New Jersey
INGERSOLL RAND CO.
11 Broadway
New York 4, N. Y.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

Pumps, Cooling Water

BROWN & SHARPE MFG. CO.
235 Promenade St.
Providence 8, R. I.
DE LAVAL STEAM TURBINE CO.
Trenton 2, N. J.
INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis, Ind.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

Pumps, Fuel Oil Injection

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
C. A. V. LIMITED
Acton, London, W. 3, England
DIESEL ENGINEERING & MFG. CORP.
200 N. Laflin St.
Chicago 7, Illinois
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.
E. A. WILDERMUTH
1102 Atlantic Ave.
Brooklyn 16, N. Y.

Pumps, Fuel Transfer

BROWN & SHARPE MFG. CO.
235 Promenade St.
Providence 8, R. I.
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, New Jersey
HANCOCK MACHINE CO.
300 Walnut St.
Findlay, Ohio
INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.
GEO. D. ROPER CORP.
340 Blackhawk Park Ave.
Rockford, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa

Pumps, Hydraulic Controls

BROWN & SHARPE MFG. CO.
235 Promenade St.
Providence, R. I.

Pumps, Lubricating Oil

BROWN & SHARPE MFG. CO.
235 Promenade St.
Providence 8, R. I.
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, New Jersey
MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.
WM. W. NUGENT & CO.
410 N. Hermitage Ave.
Chicago 22, Ill.
GEO. D. ROPER CORP.
340 Blackhawk Park Ave.
Rockford, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa

Pumps, Oil

DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, New Jersey
GEO. D. ROPER CORP.
340 Blackhawk Park Ave.
Rockford, Ill.
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Indiana
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

Pumps, Rotary Gear Type

BROWN & SHARPE MFG. CO.
235 Promenade St.
Providence 8, R. I.
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, N. J.
GEO. D. ROPER CORP.
340 Blackhawk Park Ave.
Rockford, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

Pumps, Stripped Models

BROWN & SHARPE MFG. CO.
235 Promenade St.
Providence 8, R. I.
VIKING PUMP CO.
Cedar Falls, Iowa

Pumps, Vacuum

ROOTS-CONNERSVILLE BLOWER CORP.
Connersville, Ind.

Purifiers, Fuel Oil

See also "Conditioners, Fuel & Lube Oil"; "Reclaimers, Oil"; and headings under "Oil".

FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.

Purifiers, Lubricating Oil

See also "Conditioners, Fuel & Lube Oil"; "Reclaimers, Oil"; and headings under "Oil".

FRAM CORP.
Providence 16, R. I.
GUSTIN-BACON MFG. CO.
Kansas City 7, Mo.
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.

Purifiers, Oil

See heading above.

CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
THE DE LAVAL SEPARATOR CO.
165 Broadway
New York 6, N. Y.
FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.

Push Rods

THE CHICAGO SCREW CO.
2701 Washington Blvd.
Bellwood, Ill.

Pyrometers, Exhaust

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Pyrometers, Portable

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Radiator Cooling System Treatment

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
YOUNG RADIATOR CO.
Racine, Wisconsin

Radiators, Engine Cooling

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
THE TRANE CO.
La Crosse, Wisconsin
ROME TURNEY RADIATOR CO.
Rome, New York
YATES-AMERICAN MACHINE CO.
Beloit, Wisconsin
YOUNG RADIATOR CO.
Racine, Wis.

Rail Car Engines

ABOE, INC.
Empire State Bldg.
New York 16, N. Y.
BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

Reamers

LEMPCO PRODUCTS, INC.
5490 Dunham Rd.
Bedford, Ohio

Rebabbitting, Centrifugal

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

Reclaimers, Oil

See also "Conditioners, Fuel & Lube Oil"; headings under "Purifiers" and "Oil".
GUSTIN-BACON MFG. CO.
Kansas City 7, Mo.
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.

Reducing Motions, Engine Indicating

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

Regulators, Current & Voltage

See also headings under "Voltage".
AMERICAN BOSCH CORP.
3664 Main St.
Springfield, Mass.
DELCO-REMY DIV.
GENERAL MOTORS CORP.
Anderson, Ind.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
SAFETY CAR HEATING AND LIGHTING CO., INC.
P. O. Box 904
New Haven 4, Conn.

Regulators, Generator Voltage

BURLINGTON INSTRUMENT CO.
203 North 3rd St.
Burlington, Iowa

Regulators, Temperature

AMERICAN MOTORS CO.
21 Nevin Avenue
Richmond 5, Calif.
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee
THE POWERS REGULATOR CO.
2720 Greenview Avenue
Chicago 14, Ill.

Relays

AUTOMATIC SWITCH CO.
391 Lakeside Ave.
Orange, N. J.
DELCO-REMY DIV.
GENERAL MOTORS CORP.
Anderson, Ind.

Repairs, Diesel

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.
SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.
GRIFFIN EQUIPMENT CORP.
880 E. 141 St.
New York 54, N. Y.
E. A. WILDERMUTH
1102 Atlantic Ave.
Brooklyn 16, N. Y.

Reversing Switches

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

Rheostats, Plating Tank Type

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

Roller Bearings

SKF INDUSTRIES, INC.
Front St. & Erie Ave.
P. O. Box 6731
Phila. 32, Pa.

Rotary Grinders

VAN NORMAN CO.
Springfield 7, Mass.

Rotary Pumps

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

Rotor Blower Service Tools

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Rust Preventatives

See also "Anti-Rust Compounds"
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
THE TEXAS COMPANY
135 E. 42nd St.
New York 17, N. Y.
YOUNG RADIATOR CO.
Racine, Wisconsin

Rust Removers

OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.

Safety Controls, Engine

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee
PENN ELECTRIC SWITCH CO.
Goshen, Indiana
SYNCHRO START PRODS., INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

Scale Removal

D. W. HAERING & CO., INC.
205 W. Wacker Drive
Chicago 6, Ill.
OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.

Scavenging Air Blowers

See also headings under "Blowers", "Supercharging Blowers", "Turbochargers and Superchargers".
READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

Schools, Diesel Mechanics

See also "Diesel Schools".
ADCOX SCHOOL
237 N. E. Broadway
Portland 12, Oregon

Screw Machine Products

THE CHICAGO SCREW COMPANY
2701 Washington Boulevard
Bellwood, Illinois

Screw Machine Products Hardened & Ground

BURGESS-NORTON MFG. CO.
Geneva, Ill.

Sealing Rings

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.
KOPPERS CO., INC.
Metal Products Div.
Bush and Hamburg Sts.
P. O. B. 626
Baltimore 3, Md.

Seals, Automatic Shaft

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

Service, Injection Systems

See also "Injection Systems, Service"; "Fuel Injection Systems"; "Repair & Service".
DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Va.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Service Tools, Diesel Engine

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

Shock Absorbers

DELCO PRODUCTS DIVISION
GENERAL MOTORS CORP.
329 East First Street
Dayton 1, Ohio

Signal Systems—Alarm for Liquid Level, Pressure, Temperature and Electric Current

ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Silencers, Air Filter, Intake

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
AMERICAN AIR FILTER CO., INC.
445 Central Ave.
Louisville 8, Ky.
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.

Silencers, Exhaust

See also headings under "Mufflers".
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.
THE FLUOR CORP.
403 W. Eighth St.
Los Angeles 22, Calif.
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Silencers, Intake

See heading above.
AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.
THE FLUOR CORP.
403 W. Eighth St.
Los Angeles 22, Calif.
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Smoke Meter

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

Solvents

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Solvents, Degreasing

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

Solvents for Petroleum Residues

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
MAXFAL CHEMICAL CO.
33 West 42nd Street
New York, N. Y.
OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.
PETROLEUM SOLVENTS CORP.
331 Madison Avenue
New York 17, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

Spark Arrestors

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Spark Ignition, Oil Engines

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Spark Plugs

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

Special Alloy Steel Cylinder & Main Bearing Studs

See also "Bolts"; "Engine Bolts, Studs & Nuts"; "Alloy Steel Bolts & Nuts"; "Connecting Rod Bolts & Nuts".

THE CHICAGO SCREW COMPANY
2701 Washington Boulevard
Bellwood, Illinois
ERIE BOLT & NUT CO.
1325 Liberty St.
Erie, Pa.

Special Maintenance Tools

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Special Tools, Mechanical Gear, Box

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Speed Reducers

LINK-BELT CO.
2045 West Hunting Park Ave.
Philadelphia 40, Pa.

Speed Reducers and Increasers

DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, N. J.
THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

Spray Nozzles, Fuel Injection

AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.

Spray Nozzles, Fuel Injection Water Cooled

SCINTILLA MAGNETO DIVN.
BENDIX AVIATION CORP.
Sidney, N. Y.

Spray Nozzles, Oil

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

Spray Nozzles, Water

See also "Nozzles, Spray, Water Cooling".

LINK-BELT CO.
300 W. Pershing Road
Chicago 9, Illinois
THE MARLEY CO., INC.
Fairfax and Marley Roads
Kansas City 15, Kansas
J. F. PRITCHARD & CO.
908 Grand Ave.
Kansas City, Mo.

Spray Ponds

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.
THE MARLEY CO., INC.
Fairfax and Marley Roads
Kansas City 15, Kansas

Spray Towers

See also "Cooling Towers".

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.
THE FLUOR CORP.
403 W. Eighth St.
Los Angeles 22, Calif.
J. F. PRITCHARD & CO.
908 Grand Ave.
Kansas City 6, Mo.

Sprockets

LINK-BELT CO.
220 S. Belmont Ave.
Indianapolis 6, Ind.

Stampings, Metal

BURGESS-NORTON MFG. CO.
Geneva, Ill.

Standby Electric Plants

See also "Diesel Generating Sets"; "Generating Sets Electric"; "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generator Systems"; "Emergency Lighting Plants"; "Packaged Generators"; "Portable Electric Plants".

D. W. ONAN & SONS, INC.
University Ave., S.E. at 25th
Minneapolis 14, Minn.

Starting Batteries, Storage

See also headings under "Batteries".

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.
SURRETTE STORAGE BATTERY CO., INC.
Jefferson Avenue
Salem, Mass.

Starting Motors, Air

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.
THE LEECE-NEVILLE CO.
5109 Hamilton Avenue
Cleveland 14, Ohio

Starting Motors, Electric

DELCO-REMY DIV.
GENERAL MOTORS CORP.
Anderson, Indiana
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
THE LEECE-NEVILLE CO.
5109 Hamilton Ave.
Cleveland 14, Ohio
E. A. WILDERMUTH
1102 Atlantic Avenue
Brooklyn 16, N. Y.

Starting Units, Engine Driven Air Compressor

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.
QUINCY COMPRESSOR CO.
217 Maine St.
Quincy, Ill.

Starting Units, Motor-Driven

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.
QUINCY COMPRESSOR CO.
217 Maine St.
Quincy, Ill.

Stationary Diesel Engines

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

Steam Cleaning Equipment

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan
OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.

Strainers, Gasoline and Light Fuel Oil

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

Strainers, Oil

AIR-MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.

Strainers, Water
CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.

Studs, Carbon
ERIE BOLT & NUT CO.
1325 Liberty St.
Erie, Pa.

Supercharger Intercoolers
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
YOUNG RADIATOR CO.
Racine, Wis.

Supercharging Blowers
See also "Blowers, Scavenging and Supercharging"; "Tubochargers, Superchargers".
READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

Switchboards and Instruments
CONSOLIDATED DIESEL ELECTRIC CORP.
Ludlow & Canal Streets
Stamford, Conn.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
INTERNATIONAL DIESEL ELECTRIC CO., INC.
13-02 44th Avenue
Long Island City 1, N. Y.
THE WHITMORE CO., INC.
100 Mill Street
Revere, Mass.

Switches, Eelectric Starting
DELCO-REMY DIV.
GENERAL MOTORS CORP.
Anderson, Indiana
THE LEECE-NEVILLE CO.
5109 Hamilton Avenue
Cleveland 14, Ohio

Switches, Liquid Level
ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Switches, Pressure
ROCHESTER MFG. CO., INC.
103 Rockwood St.
Rochester 10, N. Y.

Switches, Push Button
DELCO-REMY DIV.
GENERAL MOTORS CORP.
Anderson, Indiana
THE LEECE-NEVILLE CO.
5109 Hamilton Avenue
Cleveland 14, Ohio

Switches, Solenoid
DELCO-REMY DIV.
GENERAL MOTORS CORP.
Anderson, Indiana
THE LEECE-NEVILLE CO.
5109 Hamilton Ave.
Cleveland 14, Ohio

Switches, Temperature
ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Switchgear
ELECTRIC MACHINERY & MFG. CO
1331 Tyler St., N.E.
Minneapolis 13, Minn.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

Synchronizers, Automatic
BURLINGTON INSTRUMENT CO.
203 N. 3d St.
Burlington, Iowa
ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Ill.

Systems, Fuel Injection
See also "Injection Systems, Fuel".
SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORP.
Sidney, N. Y.

Tachometers
W. J. CONNELL CO.
121 Brookline Ave.
Boston, Mass.
ELECTRO-MECHANO CO.
264 E. Erie Street
Milwaukee 2, Wis.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Tachometers (Centrifugal)
BARBOUR STOCKWELL CO.
205 Broadway
Cambridge 39, Mass.

Tachometers, Centrifugal and Resonant Reed
JAMES G. BIDDLE CO.
1316 Arch St.
Philadelphia 7, Pa.

Tachometers For Diesel Engines
BARBOUR STOCKWELL CO.
205 Broadway
Cambridge 39, Mass.

Tachometers, Electrical
ELECTRO-MECHANO CO.
264 E. Erie Street
Milwaukee 2, Wis.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

Tachometers, Hand
BARBOUR STOCKWELL CO.
205 Broadway
Cambridge 39, Mass.

Tachometers, Mechanical
BARBOUR STOCKWELL CO.
205 Broadway
Cambridge 39, Mass.

Tanks, All Kinds
SCAIFE CO.
Oakmont, Pa.

Tanks, Compressed Air
SCAIFE CO.
Oakmont, Pa.

Temperature Recorders
THE POWERS REGULATOR CO.
2720 Greenview Ave.
Chicago 14, Ill.

Temperature Regulators, Cooling Water
AMERICAN MOTORS CO.
21 Nevin Ave.
Richmond, Calif.
THE POWERS REGULATOR CO.
2720 Greenview Ave.
Chicago 14, Ill.
UNITED ELECTRIC CONTROLS CO.
85 School St.
Watertown 72, Mass.

Testers, Battery
ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

Testing Instruments, Electrical
JAMES G. BIDDLE CO.
1316 Arch St.
Philadelphia 7, Pa.
ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Ave.
Chicago 40, Ill.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

Testing Instruments, Oil, Engine Room Type
THE GERIN CORP.
P. O. Box 653
Red Bank, New Jersey

Tests, Diesel Engine
LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

Thermocouples
GENERAL ELECTRIC CO
1 River Road
Schenectady 5, N. Y.
ILLINOIS TESTING LABORATORIES, INC
420 N. LaSalle St.
Chicago 10, Ill.

Thermometers
ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.
ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Thermometers, Dial Indicator
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
THE POWERS REGULATOR CO.
2720 Greenview Avenue
Chicago 14, Ill.
ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Thermometers, Dial Indicating, Distance Type
THE POWERS REGULATOR CO.
2720 Greenview Avenue
Chicago 14, Ill.
ROCHESTER MFG. CO., INC.
103 Rockwood Street
Rochester 10, N. Y.

Thermometers, Portable Recording
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

Timing Chains
LINK-BELT CO.
220 S. Belmont Ave.
Indianapolis 6, Ind.

Tools, Diesel Engine Service
CURTISS & SMITH MFG. CORP.
125 East 4th Street
Pottstown, Pa.

Tools, Mechanic's Hand
BROWN & SHARPE MFG. CO.
235 Promenade St.
Providence 8, R. I.

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan
SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

Tubing, Corrugated, Flexible Metallic

See also headings under "Flexible" and Hose".

ALLIED METAL HOSE CO.
37-46 9th Street
Long Island City 1, N. Y.
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7217 Powers Lane
Philadelphia 42, Pa.
ZALLEA BROS.
Taylor & Locust Sts.
Wilmington, Del.

Tubing, Flexible Metal

See heading above.

ALLIED METAL HOSE CO.
37-46 9th Street
Long Island City 1, N. Y.
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
CHICAGO METAL HOSE CORP.
1315 So. 3d Ave.
Maywood, Illinois
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7217 Powers Lane
Philadelphia 42, Pa.
ZALLEA BROS.
Taylor & Locust Streets
Wilmington, Delaware

Tubing, Flexible, Non-Metallic

RESISTOFLEX CORPORATION
Belleville 9, New Jersey

Tubing, High Pressure

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

Tubing, Plastic

See above headings.

RESISTOFLEX CORP.
Belleville 9, N. J.

Turbochargers, Superchargers

See also headings under "Blowers"; "Supercharging Blowers"; "Scavenging Air Blowers".

DR. ALFRED J. BUCHI
Engineering Office
Winterthur, Switzerland
U. S. Office, 520 Munsey Bldg.
Washington 4, D. C.

Unit Injectors, Fuel Injection

HANCOCK MACHINE CO.
300 Walnut St.
Findlay, Ohio
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, New York

Valve Guides

MICHIGAN ENGINE VALVE CO.
437 W. Columbia St.
Detroit 1, Michigan

Valve Plates & Discs of All Types & Sizes

J. H. H. VOSS CO.
785 East 144th St.
New York 54, N. Y.

Valve Refacers

LEMPCO PRODUCTS, INC.
5490 Dunham Rd.
Bedford, Ohio
VAN NORMAN CO.
Springfield 7, Mass.

Valve Seat Grinders

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Valve Seat Inserts

MICHIGAN ENGINE VALVE CO.
437 W. Columbia St.
Detroit 1, Michigan
WAUSAU MOTOR PARTS COMPANY
1005 Harrison Boulevard
Wausau, Wisconsin

Valve Tappets, Hydraulic & Mechanical

THE CHICAGO SCREW COMPANY
2701 Washington Boulevard
Bellwood, Illinois

Valves, Air, Ammonia & Gas

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville, Kentucky

Valves, for Air, Ammonia & Gas Compressors

J. H. H. VOSS CO.
785 East 144th St.
New York 54, N. Y.

Valves, Engine Indicator

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Ill.

Valves, Poppet (exhaust and inlet)

MICHIGAN ENGINE VALVE CO.
437 W. Columbia St.
Detroit 1, Michigan

Valves, Safety Cleanout

LIQUIDEPTH INDICATORS, INC.
9 Star Square
Long Island City 1, N. Y.

Valves, Sight Feed

WILLIAM W. NUGENT & CO.
410 No. Hermitage Avenue
Chicago 22, Ill.

Valves, Solenoid Operated

AUTOMATIC SWITCH COMPANY
391 Lakeside Ave.
Orange, N. J.
PENN ELECTRIC SWITCH CO.
Goshen, Indiana

Valves, Thermostatic

AMERICAN MOTORS CO.
21 Nevin Ave.
Richmond, Calif.
THE POWERS REGULATOR CO.
2720 Greenview Avenue
Chicago 14, Ill.

Valves, Three Way

DAVIS ENGINEERING CORP.
1064 East Grand Streeet
Elizabeth, N. J.
THE POWERS REGULATOR CO.
2720 Greenview Avenue
Chicago 14, Ill.

"Vapor Phase" Cooling System

ENGINEERING CONTROLS CO.
2835 E. 11th St.
Los Angeles 23, Calif.

Variable Speed Drives

LINK-BELT CO.
2045 West Hunting Park Ave.
Philadelphia 40, Pa.

Variable Speed Transmissions

LINK-BELT CO.
2045 W. Hunting Park Ave.
Philadelphia 40, Pa.
WESTERN GEAR WORKS
P. O. Box 192
Lynwood, California
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

Vibration Control

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois
THE KORFUND CO., INC.
48-20-A Thirty-second Place
Long Island City 1, N. Y.

Vibration Eliminators

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

Viscosity Indicating Devices

LOUIS C. EITZEN CO.
17 West 60th Street
New York 23, N. Y.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
THE GERIN CORPORATION
P. O. Box 653
Red Bank, N. J.

Voltage Controls

GENERAL ELECTRIC COMPANY
One River Road
Schenectady 5, New York

Voltage Regulators

AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa
ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street, N. E.
Minneapolis 13, Minn.
GENERAL ELECTRIC COMPANY
One River Road
Schenectady 5, New York
THE LEECE-NEVILLE CO.
5109 Hamilton Avenue
Cleveland 14, Ohio

Waste Heat Boilers

See also "Boilers, Waste Heat"; "Boilers, Exhaust Gas".

DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth, N. J.
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Waste Heat Recovery Systems, "Vapor Phase" Cooling

ENGINEERING CONTROLS CO.
2835 E. 11th St.
Los Angeles 23, Calif.

Water Cooling Equipment

See also headings under "Coolers" and "Heat Exchangers"; "Exchangers, Heat".

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 4, N. Y.

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

THE TRANE CO.
La Crosse, Wisconsin

Water Heaters, Waste Heat

DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth, N. J.

Water Purification Systems

CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

Water Softeners

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

Water Temperature Regulators

AMERICAN MOTORS CO.
21 Nevin Avenue
Richmond, California

THE POWERS REGULATOR CO.
2720 Greenview Avenue
Chicago 14, Ill.

Water Test Kits (Chromate Inhibitor Content)

THE GERIN CORP.
P. O. Box 653
Red Bank, N. J.

Water Treatment (Cooling)

D. W. HAERING & CO., INC.
205 W. Wacker Drive
Chicago 6, Ill.

Welding, Diesel Parts

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

Weldments (Steel Bases, Frames, Supporting Structures for Diesels)

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

Whistling Fill Signals

SCULLY SIGNAL CO.
88 First Street
Cambridge, Mass.

Wrenches

SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

Wrenches, Open End, Crowfoot

TUBING APPLIANCE CO.
10321 Anza Avenue
Los Angeles 45, Calif.

Wrenches, Open End, Ratchet

TUBING APPLIANCE CO.
10321 Anza Avenue
Los Angeles 45, Calif.

Wrenches, Socket

SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

Wrenches, Special, For Diesel

TUBING APPLIANCE CO.
10321 Anza Avenue
Los Angeles 45, Calif.

Wrenches, Torque

AMMCO TOOLS, INC.
2100 Commonwealth Ave.
North Chicago, Ill.

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

SNAP-ON TOOLS CORP.
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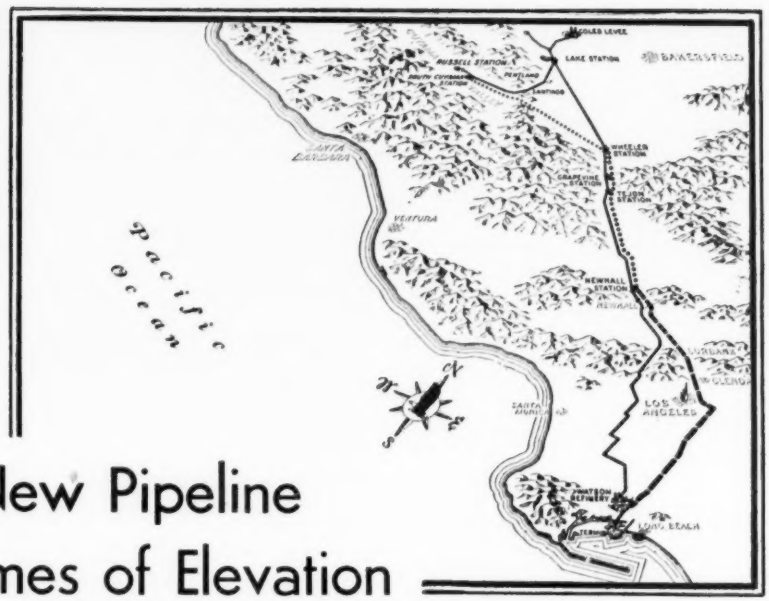
Please Remember to Say — —

"I Saw It In Diesel Power and Diesel Transportation"



Route of the Richfield pipelines. Solid line represents existing lines up to the time that additional 14 in. pipeline (dashed line) was completed in February, 1950. Small dots indicate additional 10-in. line completed in March, 1950 and the large dots, additional 14-in. line completed January 31, 1951. Stars indicate main line pump stations.

Richfield's New Pipeline Traverses Extremes of Elevation

THE newly completed 112-mile Richfield Oil Corporation pipeline is said to have the greatest variation in elevation of any pipeline of its size in the world. From an elevation of less than 75 ft. above sea level to nearly 4300 ft. in the Tejon Pass, it crosses numerous peaks and valleys like a giant roller coaster, running from Wheeler Ridge south of Bakersfield, California, through the Tejon Pass in the Tehachapi Mountains into the San Fernando Valley and then on down to the refinery near Wilmington.

This new 14-in. pipeline roughly parallels a 125-mile, 10-in. line from the older Buena Vista Lake pumping station about seven miles east of Taft, California, which was completed in 1925. The last 54-mile section of the new line between Wheeler Ridge and the Newhall station as shown by the heavy dotted line in the accompanying map, connects the new 10-in. line completed in 1950 (see lighter dotted line) with the portion of the 14-in. line extending to the refinery completed in 1950 also. The new line has a rated capacity of 75,000-bbl. a day which with the old line makes a total of 105,000-bbl. daily.

Only two pumping stations, the one at Wheeler Ridge, the other the Tejon station at Newhall are needed to carry the oil through the 112 miles of the new line. These stations were constructed by the Refinery Maintenance Corporation.

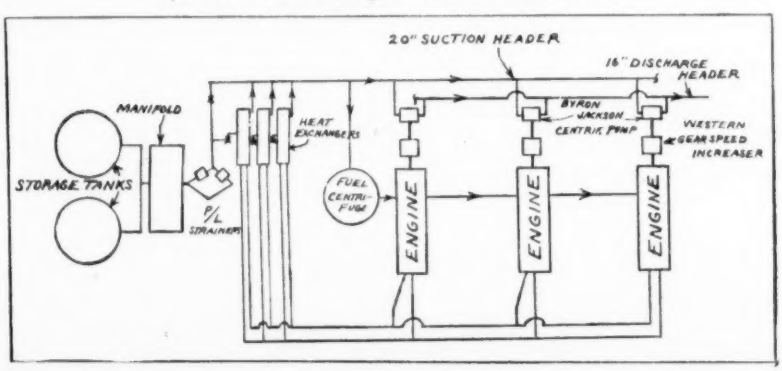
Each station has three Nordberg FSG-137-SC, turbocharged, 4-cycle, duafuel diesel engines, each rated 1050 hp. at sea level, or 987 hp. at 3075 ft., which is the elevation of the Tejon station. These engines have seven cylinders, 13-in. bore by 16½-in. stroke, and operate at 450 rpm. One of the engines at each station is a standby unit. These engines can operate on either natural gas or crude oil depending on availability and economy.

At present these engines are operating on Cuyama crude which has a viscosity of 44 (SSU at 100° F) with an API gravity of 35.5 and a sulphur content of 0.38 per cent. This crude is preheated by means of a Ross fuel oil heater using jacket water as the heating medium. The crude is first cleaned and dehydrated by means of centrifuges. Since carbon and sulphur are considerably higher than permitted in refined diesel fuels, the injection pumps and nozzles are made of corrosion-resisting materials and are liquid cooled.

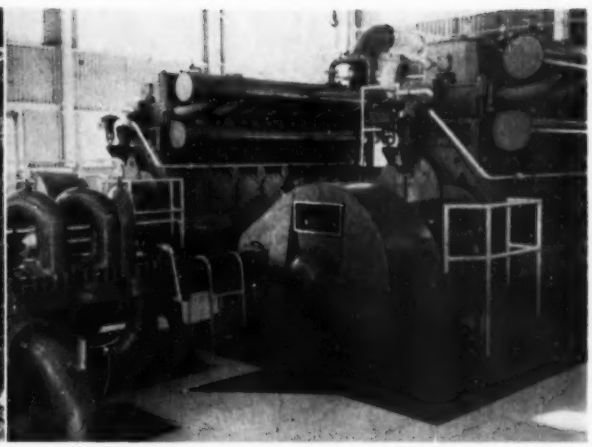
Gas will be available later and at that time will be the principal fuel with Cuyama crude as pilot fuel. As duafuel diesels, the Nordberg engines are arranged to operate on any proportion of gas and oil and automatically change from gas to oil in case of an interruption of a gas supply.

Engine accessory and auxiliary equipment includes variable speed hy-

Schematic flow diagram of typical pumping station. Note the use of heat exchangers to cool engine jacket water while heating the crude at the same time.



Pipeline passing over some of the rough terrain between Wheeler Ridge pump station and Newhall.



1 to 8 speed increasers between engines and centrifugal pumps increase 450 rpm. engine speed to 3600 rpm. required by pumps.

draulic governors arranged to control the engine over a speed range of 383 to 472 rpm., pyrometer equipment, electric tachometers and alarm systems to indicate high jacket water and/or low lubrication oil pressures.

Engine jacket water and lube oil, including the lubricating oil for the speed increasers are cooled in heat exchangers using the crude oil as a cooling medium. With this arrangement, no raw water cooling equipment is necessary.

The air intakes are equipped with both silencers and oil bath filters. Lubricating oil is kept clean by filters incorporating heaters. Exhaust silencers are fitted with relief covers.

While the engine speed is but 450-rpm., this is stepped up to 3600-rpm., the speed required for the Byron Jackson 6 by 8 six-stage, horizontal split case, centrifugal pipeline pumps. This is done by means of 1 to 8 speed increasers made by Western Gear Works. These increasers incorporate precision hobbed herringbone gears, alloy-bronze backed sleeve bearings, pressure-feed lubrication and heat exchangers.

The pumps have a rated capacity of 39,000-bbl. a day at 1000-psi. when pumping crude of 33 API gravity.

The pipeline itself for the most part is 14-in. O.D. with a ¼-in. to ⅜-in. wall electric weld and seamless pipe and was jointly laid by J. E. Young Pipeline Construction, Inc. and Alex Robertson Co. The pipe was supplied by several manufacturers. Fourteen miles of the line, between the two pumping stations was laid by Engineers Limited Pipeline Company, using 16-in. pipe. This larger pipe, according to the engineers, reduced by one the number of stations needed to move the oil. This 16-in. portion has a 9/32-in. to ⅜-in. wall

The heaviest pipe was used only where the greatest pressures prevail, such as adjacent to the pumping stations. By using the lighter pipe for other sections, a considerable saving in steel was made.

Sectionalizing gates were installed on either side of all major stream crossings and at other critical points in the line to prevent loss of oil should a break in the line occur. The line, having long radius field and shop bends, was built to permit the use of internal scrapers to remove deposits and thus prevent loss of efficiency.

The pipe was coated throughout its entire length with bitumastic material and in addition it is planned to apply cathodic protection devices to further prevent corrosion. Insulating flanges were installed at all sectionalizing gates and electrolysis test stations installed at regular intervals.

The pipeline valves were by WKM Company with the pump station valves by Nordstrom Valve Company. A 55,000 barrel tank was installed at Wheeler Ridge, erected by Chicago Bridge & Iron Company.

An interesting side light in connection with the construction of the line is that the section in the Tehachapi Mountains passes through the Angelus National Forest where fire hazards are great during summer and fall and when there is no rainfall. Forest rangers were assigned to accompany the construction with suitable fire fighting equipment and the construction crews were to be under the direct command of the rangers as fire fighters in the event of fire.

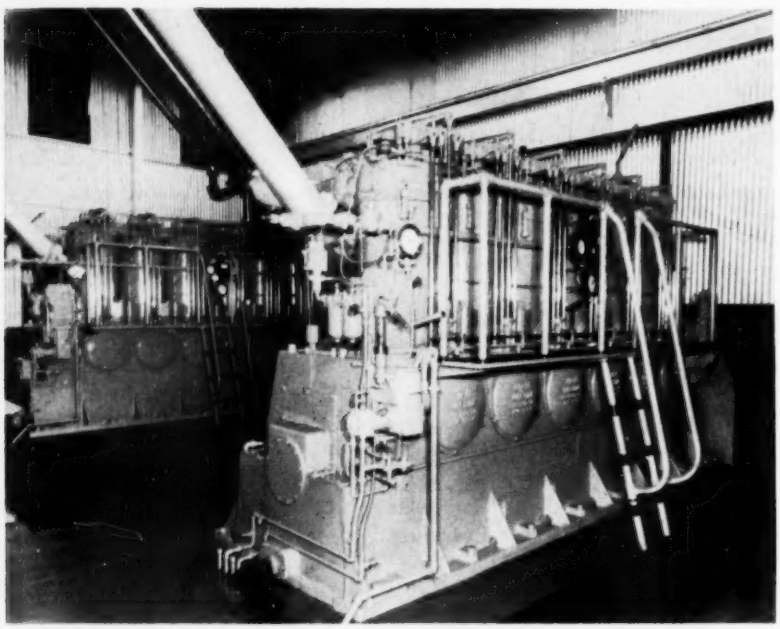
The new project, linking as it does the Wilmington refinery with the San Joaquin and Cuyama Valley fields, was built at a cost of $7,000,000. Richfield Oil Corporation now has a total of 714 miles of trunk and feeder lines which will assure steady, economical, dependable transportation for its rapidly increasing oil production.

PRINCIPAL ENGINE ACCESSORIES

Pyrometers	Illinois Test & Laboratories Co.
Governors	Woodward Governor Co.
Tachometers	Weston Instrument Co.
Alarm Systems	Viking Pump Co.
Coolers, Water & Lube Oil	Ross Heater Mfg. Co.
Silencers, Exhaust	Maxim Silencer Co.
Silencers, Intake	Air Maze Corp.
Oil Bath Air Filters	American Air Filter Corp.
Lube Oil Filters	Honan Crane Corp

Lubricating Pipeline Engines

A major oil transporter uses lube reclaimers to keep diesels in service at 5 stations; lube costs $58.00 to pump a million barrels of oil.



Two 400-hp. Atlas-Imperial diesels that have been available for service virtually all the time since their last regular overhaul. One has a 100 per cent record and the other, 99.996 per cent. One answer is clean oil.

THERE are two main objectives in lubricating pipeline engines; first, keep the units in service or available for service at all times; second, keep operating costs down. One of the major oil pipeline companies in the Southwest has used continuous purification of lubricating oil in achieving a ten-year record of operating success.

This company serves oil fields in East Texas, West Texas and South Texas and operates about 600 miles of trunk line and 800 miles of gathering line. To move the oil, there are 25 main line pumping stations with power equipment ranging from 150 hp. to 800 hp. There are, in all, 25 engines, including 8 diesels—all 400-hp. Atlas-Imperials—and 17 natural gas engines, of which there are three 400-hp. Clarks, six 150-hp. Waukeshas and eight 150-hp. Budas. The other stations have motor driven pumps.

These engines completed eleven full years of service in January, 1951, and were consistently overloaded during the war years. Overhauls were scheduled at 12,000 hours. After 70,000 hours of operation, average cylinder wear was just 0.022 in. More than 80 per cent of the original main bearings and more than 60 per cent of the original connecting rod bearings were still in service. In each 12,000 hours, the engines were down for servicing an average of 10 hours, and were available for service 99.92 per cent of the time.

To achieve this continuity of service, the company's engineers considered it essential to keep lubricating oil in peak condition at all times. In five stations powered by a pair of 400-hp. engines, they installed as original equipment a Hilco oil reclaimer which uses heat, vacuum, activated clay and mechanical filtration to combat dilution and contamination of the oil. In the stations using the 150-hp., higher-speed engines, Fram cellulose filters were used.

A description of equipment, methods and performance at one typical station may serve to clarify the picture. At this station, two-6-cyl., 13 by 16-in., 400-hp. Atlas-Imperial diesels, turning at 327 rpm., drive 4-stage 6-in. Ingersoll-Rand centrifugal pumps through Westinghouse gear units with a speed ratio of 10.245 to 1. In practice, the two pumps are compounded, providing 8 stages. Much of the pumping is done from storage tanks and inlet pressure is just 10 lb. Oil leaves the station at 900 lb.

In the year ending October 31, 1950, the two engines ran a combined total 8527 hours and pumped 9,954,203 bbl. of oil. This required consumption of 192,832 gal. of fuel oil, or an average of just 0.0193 gal. per bbl. pumped. Total lubricating oil consumed during the year was 833 gal., an average of 0.000083 gal. per bbl. pumped. This lube consumption amounted to 4095 hp. hr. of engine operation per gal. of lube. Figuring 6-cent fuel and 70-cent lube, the job of boosting nearly 10,000,000 bbl. of oil from 10 lb. to 900 lb. cost $11,569.92 for fuel and $583.10 for lube, an average of $0.001158 per bbl. pumped for fuel and $0.000058 for lube, a combined total of 1.2 mills per bbl. In the case of the engines which burn cheap natural gas, the fuel cost was much lower.

On November 1, 1950, one of the engines had run 13,240 hours since its last overhaul, the other 11,700 hours. In 25 months, the first unit had been available for operation 100 per cent of the time. The second unit had been down for servicing for 40 minutes, which means an availability of 99.996 per cent.

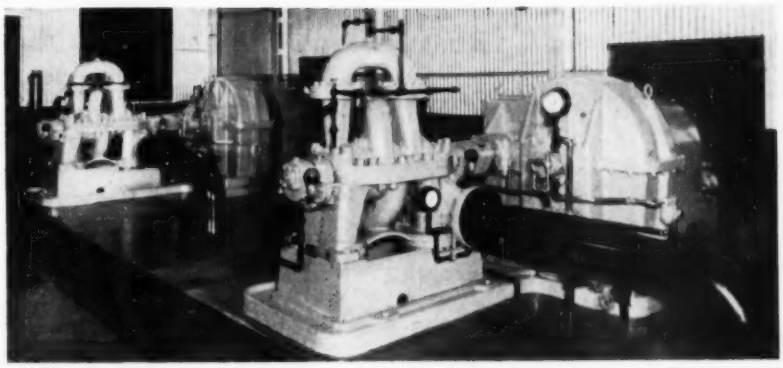
The lubricating oil used at this station is an SAE 40, detergent-type oil. The oil is circulated by an engine-

driven pump from a sump tank to the bearings and also through a Ross oil cooler. Cylinders are supplied by Madison-Kipp force-feed mechanical lubricators. A small motor-driven pump in an adjoining building draws lube from the sump tank and puts it through a Model C-1 Hilco reclaimer, after which the oil returns to the sump. The reclaimer is in continuous operation, serving the two engines alternately.

Company engineers use the Hilco fuller's earth reclaimer in spite of the fact that it takes some of the additives out of the oil. They feel that the superior cleaning action of the activated clay more than compensates for the loss of additives. Also, they feel that the greatest need for the detergents is in the upper cylinders which are supplied with fresh additive oil by their separate lubricators.

The operators keep close track of the condition of the lube. To detect fuel dilution without delay, it is routine here to take a flash test once in every 8-hour shift and record the results in the log. If dilution or contamination of any kind is noted, the engine concerned is allotted more hours of reclaimer service until the condition is corrected.

The reclaimer is kept in operation even when the engines are not running. This is a self-sufficient station and there is always electric power available for the reclaimer and other station use. A 20-kw Electric Machinery generator is belted to the No. 1 engine and sheaves are arranged so that it can be belted also to No. 2. When the plant is not pumping, power is provided by a 20-hp. Waukesha diesel-generator set.



On the "other side of the wall" are the 6-in., 4-stage Ingersoll-Rand centrifugal pumps, each driven by an engine through 10.345 to 1 Westinghouse step-up gears.

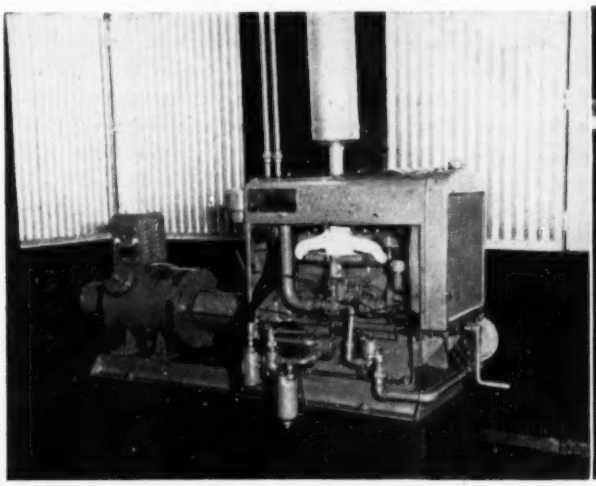
The main engines are amply protected by auxiliary equipment. Intake air is cleaned by Vortox oil-bath filters. Exhaust gases pass through Maxim silencers. A Byron-Jackson centrifugal pump belted to each engine circulates soft cooling water through the engines and through big Tulsa Boiler & Machine Co. heat exchangers.

An interesting feature of this plant is the location of the exchangers on the outgoing, high-pressure oil lines. This meant a greater initial cost, but has resulted in much greater savings in maintenance. In all the years the station has been in operation, it has never been necessary to clean the exchanger tubes. Samples of the cooling water are sent for laboratory analysis regularly and chemicals are added to keep pH and chromate concentration at the desired levels.

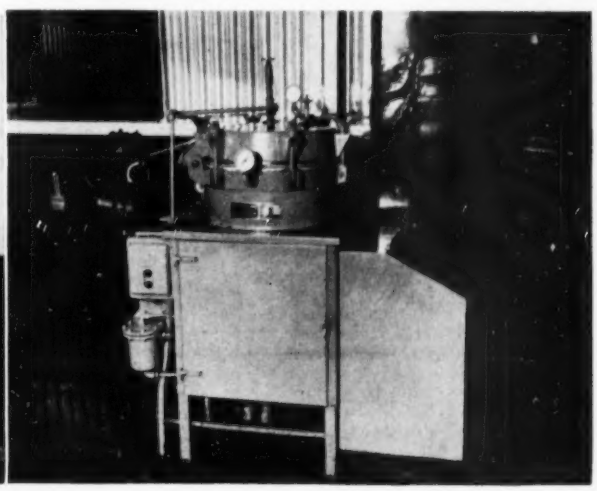
Rather than use crude oil from the lines, the company trucks in diesel fuel which is stored in two 210-bbl. tanks and is passed through a Pittsburgh meter and a Purolator filter before reaching the engines.

Compared with the dollar value of product pumped, lube oil costs are negligible, but it is evident from the experience of the pipeline company at five pumping stations over a period of eleven years that continuous reclamation of lube pays important dividends. With oil always in good condition, it is possible to minimize maintenance time and prevent enforced shutdowns. This type of sound operating procedure and preventive maintenance has kept the company's prime movers virtually always available for service.

When plant is not pumping, a 40 hp. Waukesha diesel-generator set supplies power for general station use including oil reclaimer operation.



This Hilco oil reclaimer is in continuous operation, alternately purifying lube oil for the two pumping engines. Five stations are so equipped.



Maintenance of Water-Cooling Towers

*by Howard E. Degler**

LIFE of any piece of equipment is directly dependent upon its inherent qualities, type of service, severity of operation, general care and maintenance, and climatic conditions. This discussion of the operation and maintenance of water-cooling equipment is given in order to obtain maximum results under varying heat load requirements and changing weather conditions.

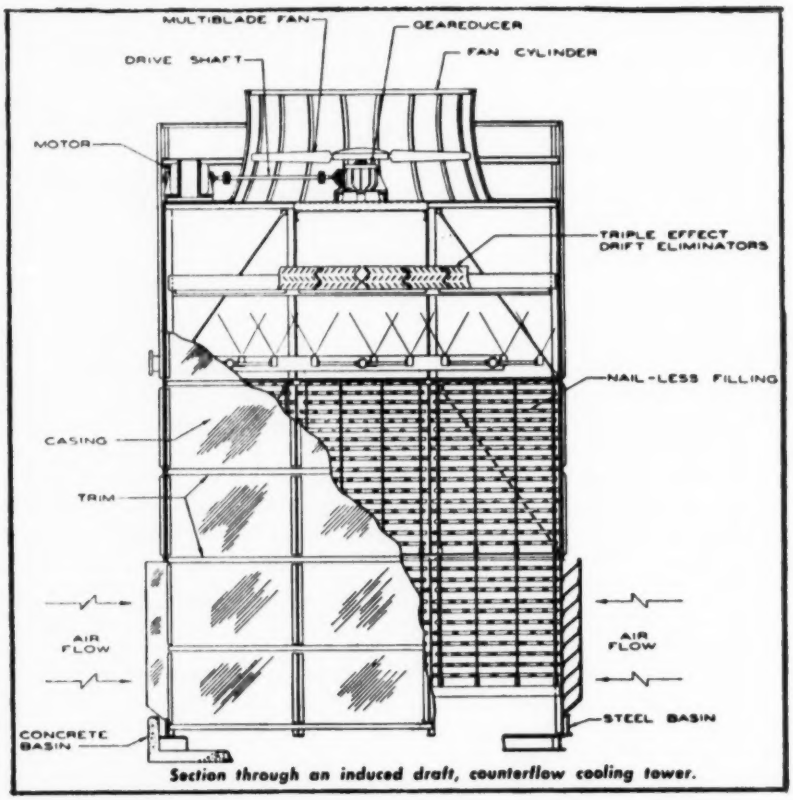
Water Treatment

Treatment of cooling tower water includes: prevention of corrosion and scale formation on heat-exchanger equipment; prevention and control of algae; and control of delignification of cooling tower lumber. Injurious delignification of wood is seldom encountered in cooling tower operation.

Amount of make-up water required by cooling tower depends upon evaporation loss, drift loss, and blow-down. Evaporation losses average for each 10° F range. Drift loss is 0.75 per cent of the water circulated the water carried from the tower by the air current in the form of droplets or mist. This loss approximates one-tenth of one per cent in properly designed induced draft towers; most manufacturers will guarantee a drift loss not to exceed two-tenths of one per cent.

Amount of blow-down water required depends upon hardness of circulating water, type of water softener or inhibitor used, and amount of drift loss. Blow down is normally controlled to maintain the concentration of dissolved and scale-forming solids below the point where the formation of scale would occur or would be caused by corrosion.

Scale—Some scale-forming materials are found in practically all water, however, the most troublesome in water-cooling systems are normally calcium and magnesium carbonates and sulphates. Too high a concentration of dissolved solids in cooling-tower water will raise the effective wet-bulb temperature, which in turn raises the temperature of the water leaving the tower and may cause sludge or corrosion in the system. These dissolved solids also cause scale formation on equipment, thereby causing a reduction in the heat transfer rates.



Section through an induced draft, counterflow cooling tower.

Scale can be reduced materially, or prevented, by treating the make-up water by some softening process. The following methods for scale prevention may be used, however, the choice is largely one of an economic nature and since water treatment requires close regulation and control, a competent chemist should be consulted.

1. *Use the lime softening process to remove carbonates.*
2. *Use hydrogen-replacing zeolites which do not produce sodium bicarbonate or carbonate.*
3. *Use sodium zeolite softening and add sufficient sulphuric acid, thereby converting the bicarbonates to sulphates.*
4. *Use one of the soluble phosphates.*
5. *Convert the carbonates to sulphates by adding sulphuric acid.*
6. *Use chromates.*
7. *Regardless of the water-treating method used, a systematic program of blow-down should be established to control the dissolved solids in the circulating water.*

Algae—Algae formations may plug

*Technical Director, The Marley Co., Inc., Kansas City, Kansas

nozzles and prevent proper distribution of the water over the tower filling. This growth may also collect on the equipment served by the cooling tower and thereby decrease the heat transfer rate. In addition to algae, a microscopic examination of slime, which may accumulate on the water side of various heat transfer surfaces, shows inorganic matter bound by filamentous forms of bacterial growth. Destruction of this slime by chemical treatment of the water eliminates the binder for this inorganic matter and thus precludes the possible future growth of algae.

Chlorine is a chemical frequently used as an algaecide; it is an effective and inexpensive means of controlling this troublesome growth. Regardless of the algaecide used, the growth, in time, may become immune to that chemical and the treatment must be changed. This new treatment is continued until the old treatment again becomes effective. Other chemicals that can be used effectively to control algae are: copper sulphate, liquid bromine, potassium permanganate, chlorinated lime, and various blends of chlorophenates.

It would be expedient to begin the use of an algaecide before too much algae has begun to grow, otherwise too much of the growth would be killed at one time, and the dead algae would tend to clog the system as it is carried off by the circulating water.

Delignification — Delignification is defined as the chemical deterioration of lumber wherein the lignins of the wood are dissolved by the chemicals of some cooling waters. It is generally caused by the combining of sodium carbonate from the cooling water, with the lignins and cellulose fibers of the wood. Delignification leaves the wood in long, stringy fibers. Prolonged exposure reduces the structural strength of the wood. The critical points in the tower, with respect to delignification, are the parts that are alternately wet and dry. Here, evaporation greatly increases the concentration of the sodium carbonate.

An indication of the extent of sodium carbonate in the circulating water is the pH of that water. A pH value of 9 to 11 may indicate a high concentration of sodium carbonate; it is desirable to keep the pH value between 7 and 8. In any case, the primary problem is elimination of the sodium carbonate and not of necessity a question of pH.

The water treatments recommended in the scale prevention section above are set up to keep the pH value and the tendency toward delignification at a minimum. When sulphuric acid is used to neutralize the sodium carbonate, the pH value should be kept at about 7.5 and never dropped below 7.0 because of the danger of corroding the heat-exchanger equipment, unless inhibitors have been added.

Two-Speed Motors

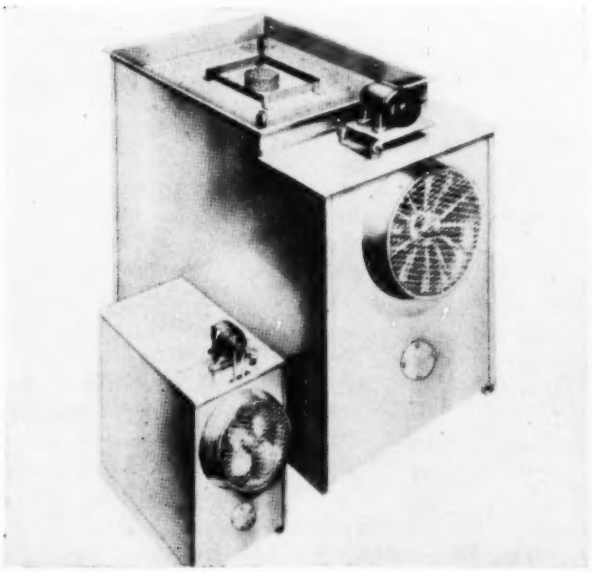
For adapting performance to temporary or seasonal decreases in heat load, and especially for winter operation, two-speed motors are best for fan drives. The chief advantage is that at half speed, fans need only about 15 per cent of their full-speed power. Especially in multi-fan units, the flexibility of two-speed motors saves power.

General Maintenance

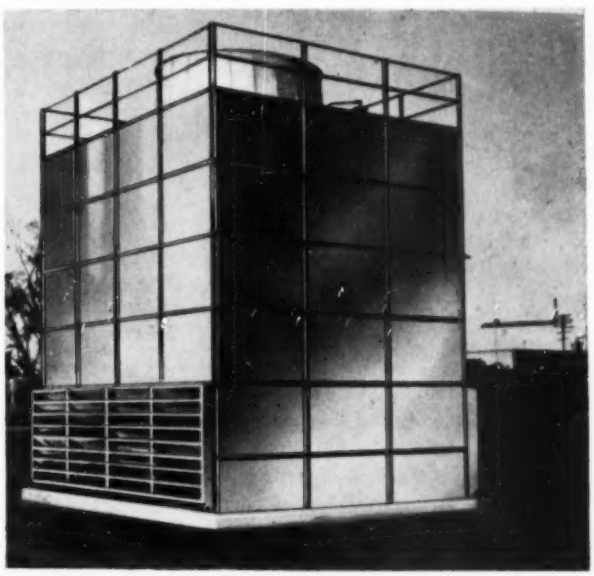
To obtain the best operating results, the distribution system and the catch basin under the tower must be kept free of dirt, algae, and scale. Fans driven by variable speed devices must not be operated above the speed for which they were designed. Concrete basins should be provided with double suction screens; that is, one set of screens placed in front of another so that all of the water goes through both.

Inspect oil in speed reducer weekly and add oil necessary to maintain proper level. Drive shafts equipped with splines, gears, or universal joints

Induced draft tower, small capacity (15 to 150 gpm); air movement is horizontal.



Induced draft tower with asbestos-cement board casing. Airflow is indicated in first illustration.



should be greased weekly. Drive shafts equipped with couplings using rubber-bending members do not require lubrication.

A daily inspection schedule is recommended to determine whether the cooling tower is operating properly.

Reduced cooling range indicates a light heat load or excess water. Increased cooling range indicates heavy load or insufficient water. When a condenser becomes badly scaled, water quantity circulated is frequently retarded and pumping head increased. Higher cooling water temperatures usually indicate this condition. Thus, if water quantity is incorrect, (1) check pump for speed, pressure, and freedom from air; (2) check condenser for scale, air or restrictions; and (3) check pipelines for air, partially closed valves, dirt, or restrictions. A daily general inspection should be sufficient for most cooling equipment installations.

Cold Weather

Extremely cold water normally does not increase performance to any great extent, but operating hazards are increased considerably. To prevent icing during cold weather operation, one or more of the following procedures are recommended for induced-draft towers; (a) shut down fans completely but do not shut off water, this may retard ice formation; (b) cover upper portion of louvered area; and (c) shut off some of the cells.

If ice should form on the louvers and filling, one of the following methods of removal could be used: (a) reversing (for a limited time) the rotation of the motor driving the fan and thus blowing the warm air backwards and out through the louvers; (b) shut down some fans temporarily but do not shut off water; (c) cover upper portion of the louvered area.

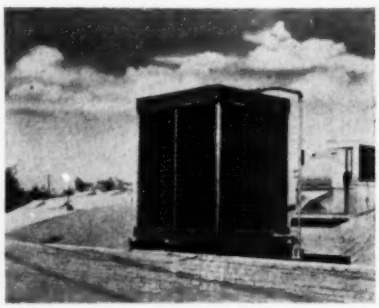
Mechanical Maintenance

A regular schedule should be set up for the mechanical maintenance of cooling equipment. Well maintained equipment gives the best operating results and the least overall maintenance cost.

Ball-bearing motors should be greased with an approved water-resistant grease every one to three months. Follow instructions issued by the motor manufacturer when greasing motors. Do not over-grease ball bearings, for over-greasing will cause their failure almost as quickly as under-greasing. Insulation value of the motor should be checked yearly.

Drain out the old oil and refill speed reducers with clean oil of the proper grade every 3000 hours of operation, or at least twice a year. The proper grade of oil for speed reducers is usually shown on the name plate. Excessive clearance or play between pinion and ring gears indicates wear. Oil leaking around the pinion shaft or fan shaft indicates that the oil seals are worn and should be replaced.

Distribution System—Inspect for clogging weekly; lubricate, tighten loose bolts and clean as required.



Natural-draft tower, spray filled.

Gear Box—Weekly, make check for unusual noise or vibration, check shafts for lateral movement, inspect keys and keyway, check oil level and oil for water and dirt, and make certain vents are open. Lubricate and tighten loose bolts semi-yearly. Repaint as required.

Motor—Weekly, make check for unusual noise or vibration, feel for overheating, check shafts for lateral movement, inspect keys and keyway, check oil level and oil for water and dirt and make certain vents are open. Dry out yearly. Lubricate and repaint as required.

Filling—Inspect for clogging, inspect for deterioration and renail (if necessary) semi-yearly.

Cold Water Basin—Inspect for clogging weekly. Inspect for deterioration yearly. Repaint and clean as required.

Structural Members—Check for unusual noise or vibration and inspect for deterioration yearly. Repaint as required.

Structural Maintenance

Remove all dirt, scale, bugs and debris from the distribution system. Replace all damaged or missing parts. Clean and paint all corrodible metals as required. Redwood does not require protection from the weather, but in some cases it may be desirable to paint it for appearance. Tighten all loose bolts, making allowance for the swelling of wood when wet.

Drift eliminators should be cleaned when appreciably dirty. Dirty eliminators reduce air flow through the cooling tower. Eliminator spacers should be aligned. When installing eliminators do not leave holes between eliminator bundles, or between ends of bundles and adjacent members, as these spaces would allow excessive drift.

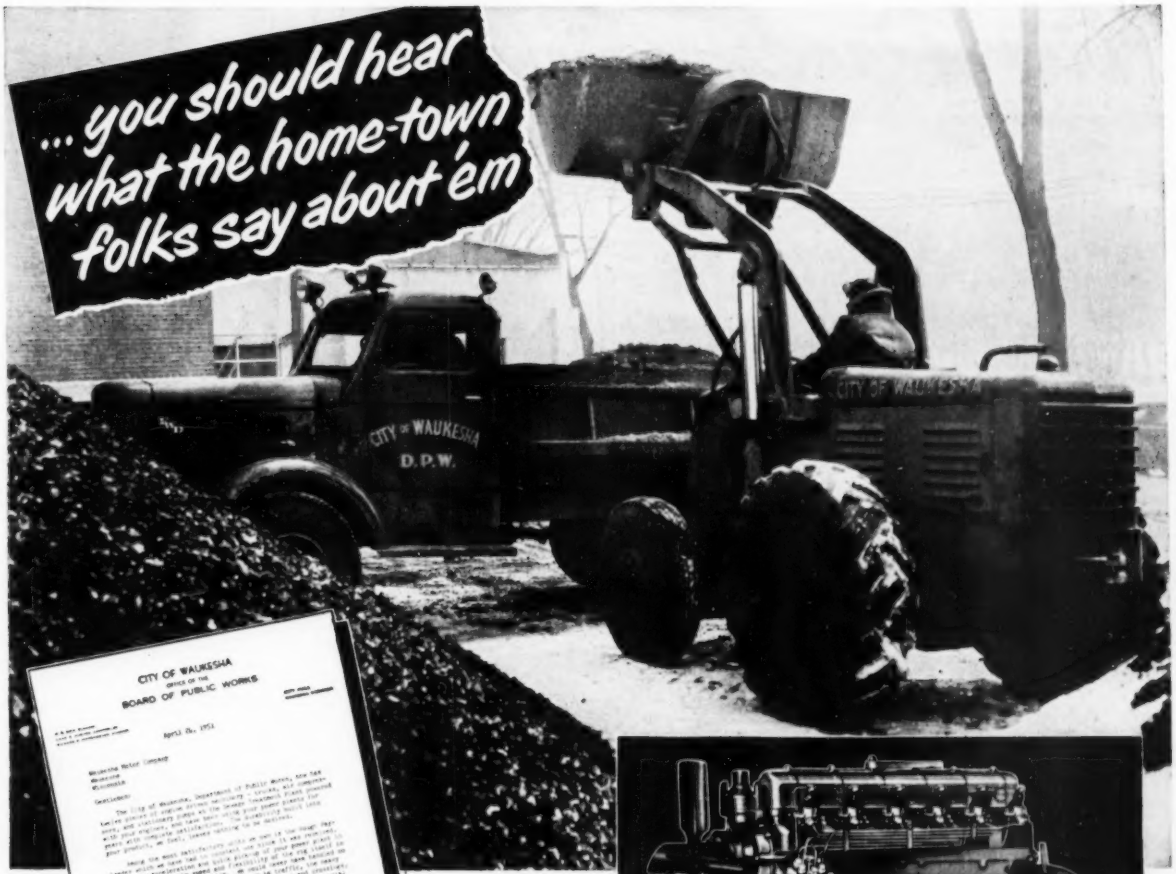
When wood filling slats become dirty they should be cleaned. Replace broken or badly warped slats, maintaining the same "pattern" or spacing of slats both vertically and horizontally as in the original installation.

Shutting Down

When cooling equipment is shut down for an appreciable time, particularly in cold weather, it should be drained to prevent damage from freezing and corrosion. Leave the drain open to allow rain and melted snow to escape. Operate the fans for a period of approximately five minutes once a week to keep the upper fan shaft bearing oiled. Protect metal parts from corrosion.

Maintenance or repair work should be done while the cooling equipment is completely shut down, if possible. This gives the best opportunity for inspection and maintenance and does not restrict the operation of any of the equipment served. A properly maintained and efficient water-cooling unit is one of the most important factors in a modern plant and will greatly improve its overall efficiency.

...you should hear what the home-town folks say about 'em



CITY OF WAUKESHA
OFFICE OF THE
BOARD OF PUBLIC WORKS

April 26, 1951

Waukesha Motor Company
Waukesha
Wisconsin

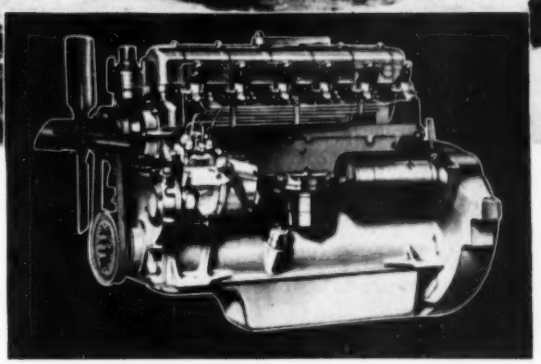
Gentlemen:

...

CITY OF WAUKESHA

...

Payloader in use by City of Waukesha has **DLCA Waukesha Diesel Engine,** six cylinders, 3¾ x 4-in., 265 cu. in., 85 max. hp at 2600 rpm. (Truck has a Waukesha Engine, too.)



The home-town folks are not easily impressed. They know you and your product, too. Save your sales talk—they pay off on performance.

This comes to you direct—from the home of Waukesha Engines. And it's Mr. W. E. Dick, City Engineer, talking—"The City of Waukesha, Department of Public Works, now has twelve pieces of engine-driven machinery . . . powered with your engines. Among the most satisfactory units we own is the Hough ***Payloader*** which we have had in constant use . . . the lively acceleration and quick pickup of your power plant in this machine, and the speed and flexibility of itself in maneuver, is beyond description. We could never have handled so quickly, and with so little interruption to traffic, the heavy snows, sleet and ice that clogged gutters and crossings without this valuable and dependable loader. Any bulk material loading job is easily and quickly handled by this versatile rig . . . also very useful in grading. This Hough ***Payloader*** with Waukesha power can't be beat."

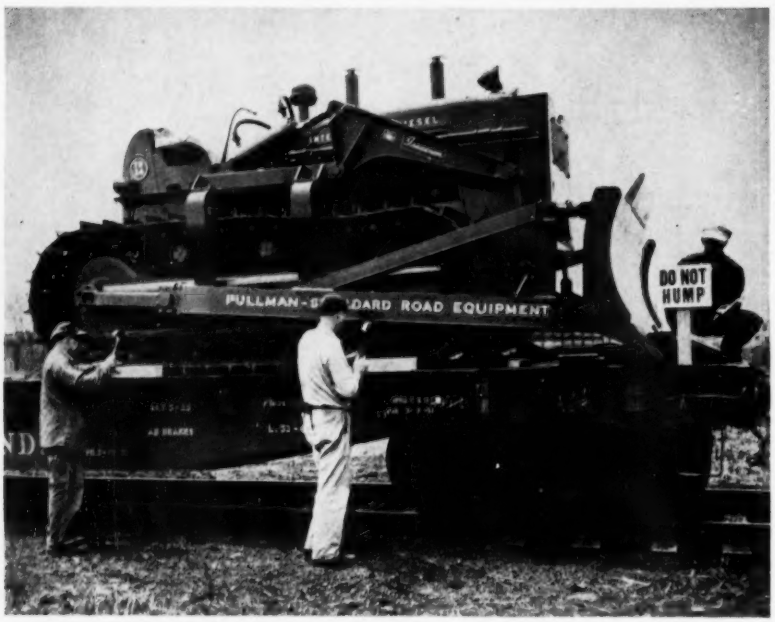
Payloaders—tractor-shovels that dig, load and carry-all types of material—are made by The Frank G. Hough Co., Libertyville, Ill., who power them with Waukesha Engines. Mr. Dick can tell you why. He has "been using your (Waukesha) power plants for years with complete satisfaction. The durability built into your product leaves nothing to be desired." Send for Bulletin 1411.

WAUKESHA *Diesel* POWER

133

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS. • NEW YORK, TULSA, LOS ANGELES

New Products



Pullman Delivers First Dozers

First of five TD-24 hydraulic dozers built by the Pullman-Standard Car Manufacturing Co. since the acquisition of the Isaacson Iron Works road equipment division, is shown being shipped from the Hammond, Ind. plant of the company. Tractors are shipped from International Harvester's nearby Melrose Park, Ill. plant to Hammond, which allows Pullman-Standard to attach its road equipment and ship the complete unit to customers.

The Issacson Iron Works was recently acquired by the Pullman-Standard Car Co., who will continue to manufacture the Issacson line of bulldozers, scrapers, rippers, hydraulic power units, crawler-type tractors. These products will be handled by the same distributors who handle the marketing of International Harvester equipment. Foreign sales are handled through the International Export Company.

Two New Engines

Two new Caterpillar industrial diesel engines, the D337 and D326, are scheduled for production sometime mid-year in 1951.

The six-cyl. D337 engine is an industrial version of the 5-⅛ in. by 6 in. engine developed as a power source for the DW20 and DW21 tractors, and is rated at 180 hp. at 1600 rpm. The D326, quite similar in design, is rated at 125 hp. at 1600 rpm.

One new feature on the two models is the fuel system with fuel pumps mounted adjacent to the cylinders they serve, resulting in standard, identical, short fuel lines for each cylinder.

A new arrangement of piston cooling has been used on these engines. The pistons, which have an iron band cast integrally for the upper ring, are cooled by an oil stream sprayed from a nozzle that is solidly attached to the engine block. This spray also lubricates the piston pin, and thus eliminates oil grooves in the connecting rod.

Fine filtration elements are used which handle the full flow of oil to the engine system. Oil passageways are thereby protected from dirt and foreign material falling into them while filter elements are being changed. Any sludge will collect at the bottom of the cams where it cannot possibly enter the oil passageways of relief valves.

A completely redesigned 25 hp. vertical gasoline starting engine is used with the engines.

Tube Cleaner

A straight tube cleaner, developed for process and refinery heat exchangers, has been announced by Thomas C. Wilson, Inc. It is called the Model-301.

This new tube cleaner weighs 15 lbs. and is 13 in. overall in length. It cleans tubes from ⅜ up to 2½ or even 3 in. O. D. Hollow shafting is available in one piece up to 20 ft. or in sectional threaded lengths, if desired. Minimum practical working headroom is 5 ft. This positive air driven, rotary shaft, drill type tool scavenges the tube with air or water while cleaning. It operates on air pressure as low as 50 lbs.

Wide Speed Range Tachometer

The Metron Instrument Company has made available a new three range, single head, fixed installation tachometer indicator for speed measuring applications where a particularly wide range of speed measurement is desired. This new instrument, Series 42P, can be used with any series Metron tachometer head.

Rotation of the indicator range knob selects one of three speed ranges to measure any speed over a total range of 40 or 50 to 1, based on readings down to 1/10 full scale of the lowest range. Scales are supplied for direct reading in any units such as rpm., fpm., in. per sec., or in any quantity which is proportional to the speed actuating the head. Various tachometer heads permit direct measurement ranges from speeds between ½ rpm. and 100,000 rpm., without any speed changing drive required.

Slide Hammer Puller

A new slide hammer puller is available at Herbrand Tools. It may be adapted to either inside or outside pulling jobs. External capacities are from 0 to 5 in. and internal gripping is from 1-1/4 to 6 in. Special push-pull holding pins make it easy to change jaws from inside to outside pulling position.

Newly designed interchangeable puller jaws, special external action expansion head and a no-pinch, safe, slide hammer are features claimed for this new tool.

New Recording Meters

A new line of recording voltmeters and ammeters has recently been announced by The Bristol Company. These instruments make a continuous record of voltage or current on an 8-in. circular chart, and feature a measuring mechanism, and a number of other improvements. The moving-iron measuring mechanism produces a high actuating torque at a low electrical burden. It has shock-protected precision stainless steel bearings, magnetic damping, and a locking device to prevent damage due to rough handling.

Automatic Function Plotter

The Brown Instrument Division of the Minneapolis-Honeywell Regulator Company has developed a new electronic device that makes possible automatic compiling of two measurements and plotting of a curve to show their inter-relationship, namely: Y equals f(X).

It incorporates two measuring systems one of which actuates the recorder pen while the other motivates the instrument chart. The chart is driven up and down in response to the changes in one variable simultaneously with the movement of the pen in response to changes in a second variable. The result is a curve which continuously evaluates one curve in terms of the other.

Laboratory or over all industrial investigations, involving such interdependent non-linear variables, are facilitated with the function plotter.

Air-Conditioner for Cranes

New type equipment for air conditioning the cabs of cranes operating in high temperatures or in atmospheres contaminated by toxic and noxious gases or dusts, has been developed by Dravo Corporation.

No ductwork is needed with the new equipment, which is known as the "Split-Type Crane Cab Cooler," because the cooling section is installed in the cab itself and the larger condenser section is placed outside on the crane in any convenient location. It provides constant, year-round ventilation, filters the air to remove dust, dirt and fumes, cools the air in summer, and, if necessary, to heat the air during winter.

Typical installations include cranes working over or around soaking pits, open hearth furnaces, bessemer converters, stripping operations and blast furnaces.

Like a police dog

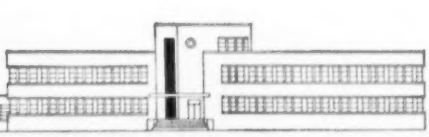
it watches and protects your engines

Oil pressure failure or overheated cooling water can happen anytime ... and it can happen to the best engine! But serious damage and costly repairs resulting from such minor troubles *can be prevented* with a PENN Safety Control.

Here's how it works. If water temperature rises beyond the predetermined safe point ... or if oil pressure falls too low ... the PENN Control goes into action! It automatically sounds an alarm, flashes a warning light or stops the engine operation ... whichever you choose. Then, the minor fault can be investigated and corrected before major damage occurs.

Simple to install on new or old engines, PENN Safety Controls are available in three basic models (1) oil pressure only (2) water temperature only (3) combination pressure and temperature. Learn more about this *low-cost protection*, send for Bulletin E-100. Write **Penn Electric Switch Co., Goshen, Indiana.** Export Division: 13 E. 40th St., New York 16, U. S. A. In Canada: Penn Controls, Ltd., Toronto, Ont.

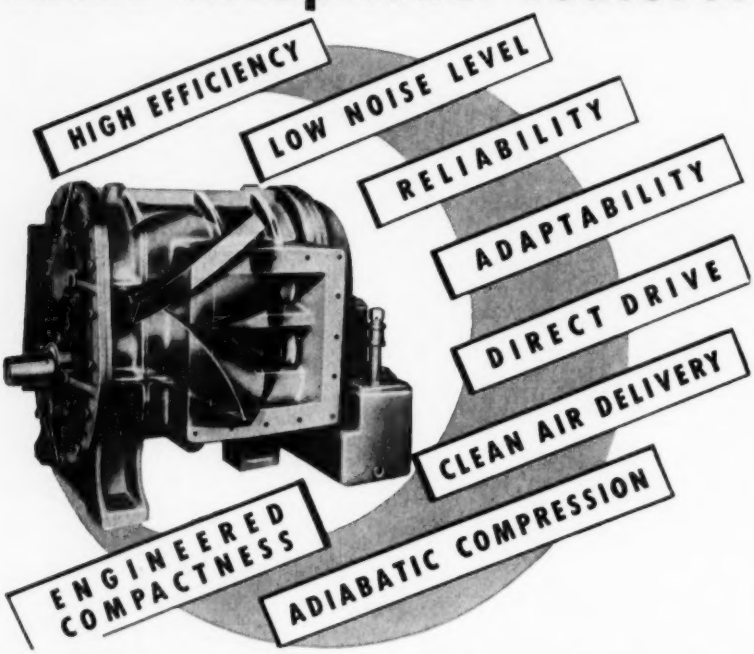
PENN



AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, PUMPS, AIR COMPRESSORS, ENGINES, GAS RANGES

The STANDARDAIRE BLOWER offers these exceptional features



WHETHER you require 20 cfm or 15,000 cfm capacity blowers these features are inherent in the unique design of the modern Standardaire positive displacement blower. Its epicycloidal rotor form acting as an air screw is unlike that used in the conventional lobe type unit—and Standardaire blowers have demonstrated their all-around superior performance to the satisfaction of many leading industrial users.

Send today for complete information. If you have specific requirements, our engineers will welcome the opportunity to work with you. Write Dept. E 47 READ STANDARD CORPORATION, 370 Lexington Ave., New York 17, N. Y.

Do you have the 1951 STANDARDAIRE Selection Chart?

BLOWER-STOKER DIVISION

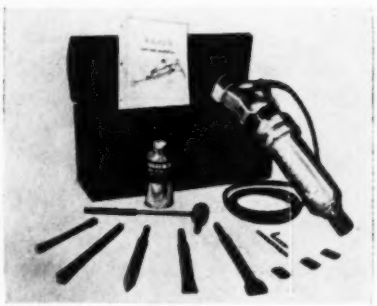
FORMERLY The Standard Stoker Co., Inc. ONLY THE NAME IS CHANGED

READ STANDARD CORPORATION

NEW YORK • CHICAGO • ERIE • YORK • LOS ANGELES

New Electric Hammer

The 25-year old Kango electric hammer line is now being introduced in this country for the first time by Allied Tools, Inc. The line consists of three size hammers: heavy, medium and light duty, and a large variety of special tools to suit many jobs.

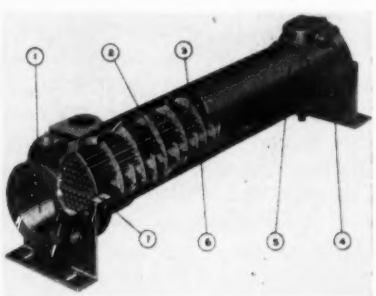


The heavy duty hammer is 22 in. long, weighs 21 lbs. and strikes 1300 blows per minute. There are 53 different tools and 119 additional variations of them.

All three sizes consist of a striker reciprocated by two centrifugal weights attached to bevel gearing which, in turn, is driven through a spline shaft by an electric motor. They are available to operate on a wide range of voltages, both ac. and dc.

Torque Converter Coolers

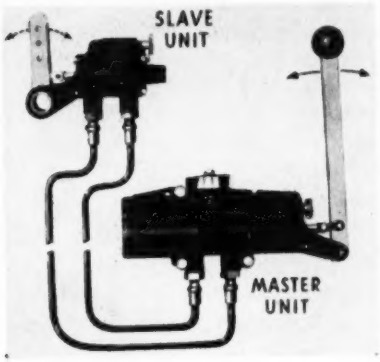
Young Radiator Company has announced a new line of torque converter coolers. The line consists of four compact shell-and-tube-bundle models ranging from 3⅝ to 6⅛ in. in diameter, for engines with 100 to 450 hp. ratings.



The units are said to be original equipment on some of the initial torque converter installations and have been "road tested" for withstanding rugged use.

Remote Control System

A new hydraulic remote control system is now being offered by Superdraulic Corporation. The complete system consists of a master unit and a slave unit interconnected by two small tubes. Motion applied to the actuating lever of the master unit is accurately duplicated by the slave unit lever. It has positive load carrying ability in both directions because its operation is not dependent upon springs, compressed air or valves.



A primary feature of this control system provides for expansion and contraction of both fluid and metal due to temperature changes in a manner that guarantees synchronization between master and slave units. An automatic lock in the slave lever provides irreversibility. The slave unit is also available without this locking feature. Either unit may be mounted stationary or movable and in any position without affecting the operation.

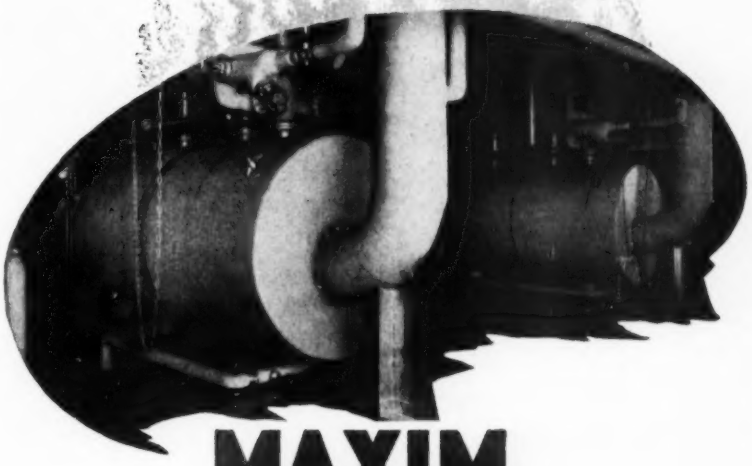
The control system is self-contained, compact, requires no external power source and is capable of handling 500 in. lbs. of torque.

New Anti-Corrosive

After considerable testing within a limited market, a new anti-corrosive, "Corrosanti", is now ready for national distribution, it was recently announced by the research laboratory of Dr. Adolph Schror.

The new product is a scientific boiler and metal protector. As such it is a treatment which reacts upon the metal treated and not upon the water surrounding the metal. It is manufactured in four grades, depending upon the purpose it is intended for.

IS WASTE HEAT WASTING YOUR MONEY?



MAXIM

HEAT RECOVERY SILENCERS CONVERT WASTE EXHAUST HEAT TO USABLE STEAM or HOT WATER

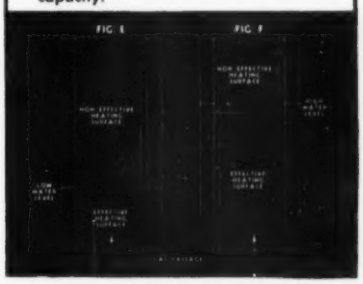
A big Los Angeles Sewage Disposal Plant found that Maxim Heat Recovery Silencers provided all the steam necessary for plant heating as well as heating the sludge — *and from exhaust heat that would otherwise have been wasted.*

Perhaps your own operating expense picture can be improved by this simple and effective way to provide extra steam or hot water for heating or processing operations while at the same time effectively silencing exhaust noise. Our engineering department will be glad to make recommendations.

Automatic Controls

In figure E water is low and there is less *effective heating surface* (heating surface in contact with water), hence lower steaming rate.

In figure F water is high and gives greater effective heating surface — higher steaming rate. Steam pressure regulated valves control the amount of water to produce desired steam capacity.



Consult MAXIM

THE MAXIM SILENCER COMPANY 93 HOMESTEAD AVE., HARTFORD 1, CONNECTICUT

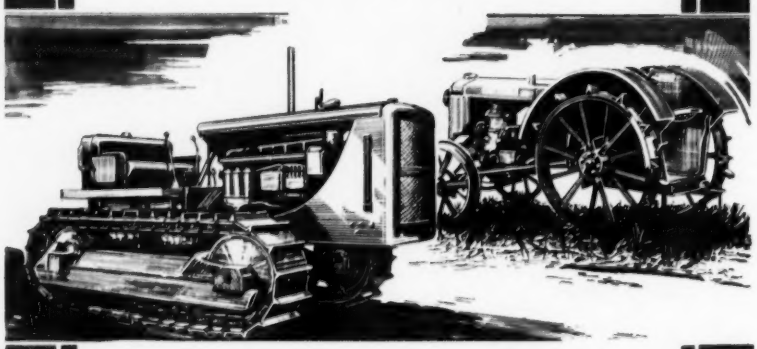
Gentlemen: Please send me your Bulletin on Heat Recovery Silencers

NAME _____

COMPANY _____

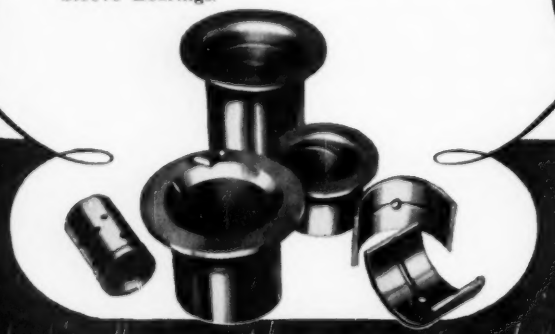
ADDRESS _____

JOHNSON BEARINGS
1901-1951



Machinery and Bearings Both do a Better Job Today

THE MECHANIZATION of the farm of 1951 demonstrates the tremendous strides made in equipment improvement in fifty years. Combines, tractors, electrified machinery and appliances do more work and are more efficient than ever before. Similar progress in sleeve bearings has been made by Johnson Bronze during this time . . . new bearing styles, refinement of bearing alloys, greater precision and closer tolerances. Johnson Thin Wall Bearings, Ledaloyl Self-Lubricating Bearings, and Johnson Aluminum Alloy Bearings now replace the old style bearings of earlier days. Much of this farm equipment is able to out-perform and out-wear earlier models simply because of new and improved Johnson Bearings. For satisfactory performance specify Johnson Sleeve Bearings.



SLEEVE BEARING HEADQUARTERS Since 1901

Johnson Bronze

470 SOUTH MILL STREET · NEW CASTLE, PA.

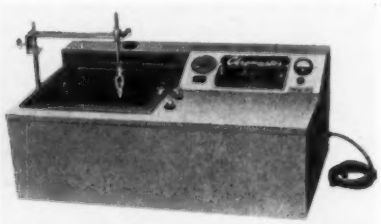
Lathe Tool Holder

The South Bend Lathe Works has available a new tool holder of the universal type. Known as the 10 in 1 tool holder, it is supplied in five sizes and can easily be adapted for use on some other makes.

Constructed of heat-treated steel, it features screw adjustment for tool height. Once adjusted, tools of the same type can be changed without disturbing the height adjustment. The holder comes equipped with a self-aligning knurling head and a pair of medium diamond knurls. Coarse and fine diamond knurls; and coarse, medium, and fine straight pattern knurls are available. Boring tools, cutting-off blades and a set of four ground cutter bits are available for boring, cutting off, turning, facing, and threading operations.

Hard Chrome Plating Unit

Model A-50 chromaster is the latest addition to Ward Leonard's new line of industrial hard chrome plating units. In combination with chromasol solution, the new model affords metal working and other industries with a new production tool for precision industrial hard chrome plating directly on cutting tools and wear parts.

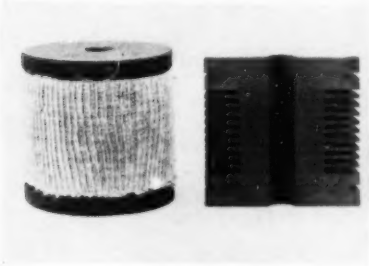


The new unit is compact and self-contained. It has a capacity for hard chrome plating metal surfaces totaling 25 sq. in. maximum at the recommended current density of 2 amps. per sq. in.

Chromasol, a non-critical plating solution developed for use in the plating units, operates at room temperature. It is shipped as a concentrated liquid ready for dilution with water prior to use. The hard chrome deposit can be applied directly on industrial steels, cast iron and most non-ferrous metals.

Cellulose Oil Filter

A new oil filter, using molded cellulose fibers as the medium, has been developed by The Briggs Filtration Company.



A bonding agent is applied to natural cellulose materials which are formed, under pressure, into "cartridges" of blocks. The size of the fibers controls the porosity of the block. The blocks are then stabilized by a series of thermal processes which fix the finished dimensions. The blocks are rendered impervious to water and therefore retain their original dimensions in use.

Laboratory and field tests on the blocks are said to show that the new medium has a high dirt retention capacity, and that there is no unloading action between filtration cycles.

Air Circuit Breaker

A new low-voltage air circuit breaker, the DB-50, has been added to the line of DB breakers manufactured by the Westinghouse Electric Corporation. With an interrupting capacity of 50,000 amperes, it is used in low-voltage industrial and commercial power distribution systems, central station auxiliaries, motor starting duty, and similiar uses.

The DB-50 features an air-delayed series over-current tripping device, with all elements completely adjustable, that provides long-time delay on overloads and instantaneous tripping of fault current. For use on feeder and back-up breakers, overcurrent trip units including both a long-time delay and short-time delay element can be specified, thus providing for selective operation on fault.

Rated at 600 volts ac., 250 volts dc., the breaker has a continuous rating of 100 to 1600 amp. It can be operated

AEROFIN

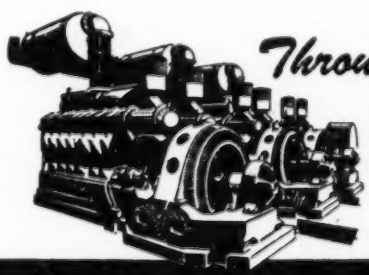
Heat-Transfer Surface

● High Efficiency
● Long Service Life
● Low Maintenance Costs

You are assured of high efficiency in heating or cooling—long service life—low maintenance and service costs, when you specify Aerofin extended-surface heat exchangers.

The reason is obvious: Aerofin makes heat exchangers *exclusively*—offers you the results of unequalled experience, unequalled production facilities, unequalled materials testing and design research—and the guidance of a complete, highly skilled engineering staff, at the plant and in the field.

For the most practical solution to your heat-exchange problem, ASK THE AEROFIN MAN.



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ENGINEERED FOR LIFE LONG POWER SUPPLY

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used for

Diesel Starting

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Portable Diesels

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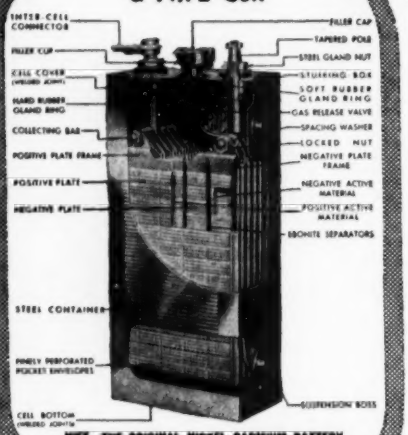
Section through a NIFE Cell



NIFE, THE ORIGINAL NICKEL CADMIUM BATTERY
• First manufactured • Most used throughout the world

featuring

Exceptionally low standing losses.

Extreme long life.

Steelbuilt—withstands shock and vibration.

Low internal resistance

No gassing during discharge

Undamaged by low temperatures.

No sulphating, shedding or buckling of plates.

Immune to excessive discharges and short circuits

For quotations and literature write Dept. D

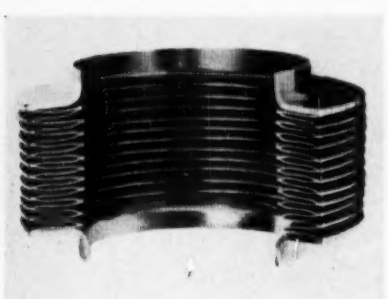
NIFE INCORPORATED

165 Broadway, New York 6, N.Y.

manually, or by either dc. solenoid or ac. Rectox solenoid. All parts are removable as complete units. De-ion arc interruption is said to provide for quick arc extinction and longer contact life.

New Expansion Bellows

Titeflex, Inc. is now manufacturing



expansion-type bellows for the absorption of high frequency vibration and lineal expansion in many types of equipment. Constructed of convoluted metal diaphragms welded into complete units, the bellows have been tested in many operations over past months and have been found especially valuable for applications involving constant high pressures, corrosive liquids and gases, and extreme temperatures in sealed piping systems. They are available in sizes from 1 to 5 in. I. D. in various lengths and are manufactured in plain and stainless steels, brass, bronze, Monel and Inconel according to individual heat, pressure and corrosion requirements. The bellows may be supplied with any type of standard or special fittings.

Thor Screwdriver

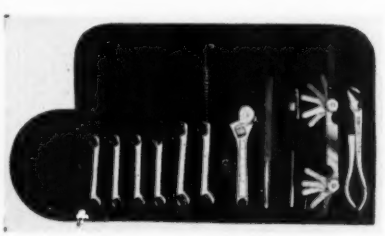
A new line of pistol grip screwdrivers has been added to Thor's Silver Line portable electric tool series, it was announced by Independent Pneumatic Tool Company.

The new line, the ED series, is available in 13 attachment and speed variations for driving up to No. 12 screws and for setting nuts up to ¼ in. thread.

The new series is available in speeds of 500, 800, and 1100 rpm. in all straight and 25° angle attachment models, and 660 and 880 rpm. in right angle models, with positive, kick-out and double slip clutches.

Ignition Set

A new ignition set of 11 pieces, covering all the tool requirements for



servicing normal ignition jobs, is now being marketed by Bonney Forge & Tool Works. The set includes six sizes of open end ignition and electrical wrenches, ignition pliers, feeler gauge, neon screw driver, point file, and adjustable wrench.

Asbestos Gaskets

Pars announced recently a new line of asbestos gaskets, designed to give service where surfaces are rough or uneven and subject to considerable expansion and contraction. They are used to hold steam, air, water, ammonia, and various other acid and alkali chemicals in storage tanks, cookers, dryers, laundry machinery, locomotives, tank cars, boilers and locomotive service.

The book, to be off the press around July 1st, is written primarily for consulting engineers, buyers, users and manufacturers of diesel engines and engine parts and accessories and as a reference for colleges and universities teaching courses in mechanical engineering.

It will be illustrated by 37 drawings and charts, and will be priced at $5.00 per copy.

Filter Catalog

A 52-page catalog is being released by DeLuxe Products Corporation, containing information and illustrations of oil filters, replacement cartridges, and removable sedisumps for all passenger cars, trucks, tractors, buses, power units and marine engines.

There is a cartridge diagnosis section, a filter specification section, and other features of interest.

New Literature

Revised "Standard Practices"

The Diesel Engine Manufacturers Association, because of progressive developments in the diesel engine manufacturing industry, found it necessary to revise the book, "Standard Practices for Low and Medium Speed Stationary Diesel Engines", first published in 1935, and revised in 1946.

The new edition is the product of member companies of the Association, which coordinated their engineering and sales departments and delegated representative to rewrite the former treatise. The 1946 edition was carefully checked for additions and needed clarifications. Sections were added dealing with dual fuel engines, operation and maintenance, starting systems, and a variety of new additions included in an appendix.

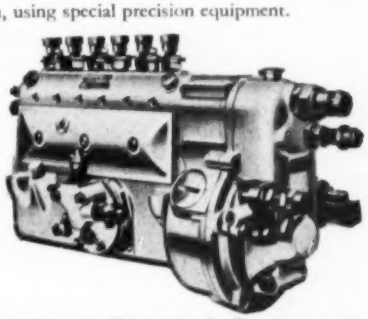
Chapter headings give an idea of the new book's scope: Definitions; Performance and Equipment; Diesel Engine Construction; Governors and Speed Regulations; Torsional Vibrations and Critical Speeds; Intake and Exhaust Systems and Heat Recovery Apparatus; Starting Systems; Cooling Water Systems; Lubricating Oil Systems; Fuel Storage and Handling Systems; Generators and Electrical Equipment; Selection of Engine Sizes; Diesel Power Plant Buildings; Erection of Diesel Engines; Lubricating Oil Characteristics and General Specifications; Invitations for Bids and Detailed Specifications; Operation and Maintenance; and an Appendix of useful information.

Confidence Abroad

Transport operators all over the world have learnt to trust this sign.

In any language the letters on the C.A.V. sign stand for first-rate service facilities, maintained by highly-trained craftsmen, using special precision equipment.

Wherever vehicles fitted with C.A.V. Fuel Injection Equipment are exported — whether to Trondheim, Santiago, Hong-Kong or Sydney — there's a service agent or depot to give it the specialist attention needed for such high-precision equipment.



C.A.V. **Fuel Injection and Electrical Equipment**

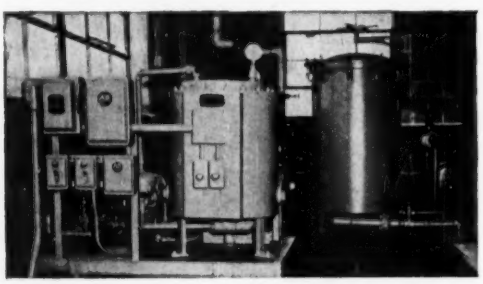
Service Depots throughout the World

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., NEW YORK 19, N.Y. Sales Office: 14820 DETROIT AVE., CLEVELAND 7, OHIO

174-344B

Hoffman I-718-18 cartridge filters provide continuous filtration of lube oil for this and other diesel engines on the Mid-Valley Pipeline. Cover-lifting device and swing-bolts speed removal of head for replacement of "throw-away" cellulose cartridges.

Lube Oil Clarity for Pump Station Diesels of Mid-Valley Pipe Line Protected by HOFFMAN Filters



Reclamation of lube oil to "like-new" standards is accomplished by Mid-Valley stations with Hoffman Model I-18-10 Vaporizers. Soluble impurities (such as light ends and water) are removed continuously by thermostatically controlled heating of the oil under high vacuum.

For the gas-diesel and straight diesel engines of Mid-Valley's pumping stations, nine Hoffman cartridge filters and three Hoffman vaporizers maintain lubricating oil with these advantages: The cartridge filters, directly connected to the engines and standby oil pumps, provide continuous purification of the lubricating oil.

Hoffman's exclusive cover lifting device and simplified swing-bolt assembly speed replacement of 7" x 18" cartridges. As an adjunct, the Hoffman Vaporizer removes solubles, at high flow rates, without the high maintenance cost of centrifuges. Write for technical bulletin.

FREE Filtration Engineering Service

For the right answer to your filtering problems, a Hoffman filtration engineer will survey your needs — make recommendations based on detailed analysis of solutions, oils and other factors. Ask for this service — there is no obligation.

FILTRATION DIVISION U.S. HOFFMAN MACHINERY CORPORATION
214 LAMSON STREET, SYRACUSE 6, N. Y.
CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO. LTD. NEWMARKET, ONT.

Military Purchasing Offices Index

A guide to industry in selling to military departments has been revised and issued by the Munitions Board. Listing commodities under 35 major categories, the booklet is cross-indexed to indicate the appropriate purchasing office for any item. Copies should be requested from the Central Military Procurement Information office, Munitions Board, Department of Defense, The Pentagon, Washington 25, D. C.

Jacket Water Cooler Catalog

Young Radiator Company recently released a 4-page, 2-color catalog on its improved line of engine jacket water coolers, said to be capable of withstanding the abuse of portable equipment installations. It describes design features of the units and accessories available as optional equipment.

Petrometer Bulletins

Two new bulletins have recently been released by the Petrometer Corporation, describing a remote reading liquid measurement device which operates on the principle of static pressure on the bottom of the tank varying directly with the liquid contents of the tank. The scales are direct reading and calibrated in inches and gallons. Scale readings are adjustable to take care of any tank pitch. The gauge may be located any place above or below the level of the tank up to a distance of one-quarter of a mile. The equipment has application in the measuring of chemicals, waxes, sewage, paints, fuel oil, lube oil, water and many other liquids.

The literature also describes the liquidepth safety cleanout valve, which gives a safe, easy vapor-tight access to tank bottoms, from a remote point, for quick removal of water and sludge.

An additional feature is that by means of a manifold only one petrometer and one liquidepth cleanout valve is all that is needed for a battery of tanks each having its own depth indicating assembly.

Diesel Catalog

Detroit Diesel Engine Division of General Motors announces a new catalog describing the Division's complete line of Series 71 2-cycle diesel engines for application in the industrial, petroleum and marine fields.

The book covers single and multiple engine units from 2 to 24 cylinders with power ranging from 32 continuous to 780 intermittent horsepower.

It contains data on GM diesel 2-cycle design and interchangeability of parts; a "Select Your Power" Chart covering 57 standard power take-off and 7 torque converter models; engine illustrations and an outline of Detroit Diesel service facilities.

Recording Meter Bulletin

A new 28-page bulletin on their line of series 500 recording voltmeters and ammeters has been published by The Bristol Company.

It describes the features of the instruments, with special emphasis on the newly-developed moving-iron measuring mechanism. Complete information is given on ranges, uses, and specifications of the various models for permanent installation and portable use. The bulletin is illustrated by photographs, charts and chart records.

Piston Ring Catalog

Thirteen different types of metallic piston rings are described in a new catalog edition now being distributed by the Double Seal Ring Company.

The 16-page booklet is twice as large as the edition it replaces. Using two colors throughout, it contains explanations of the uses of the rings listed, illustrations, and instructions for ordering.

Drawings of typical ring installations in 2 and 4-cycle diesel or gas engines, ammonia compressors, pneumatic compressors, steam engines and pumps, plus general information and recommendations on such piston ring matters as end, side and back clearance and radial thickness are special features of the improved catalog.

Trouble ahead?

TELLITE TELLS!

Operators often forget to check engine gauges. Result: bearings burn out, engines heat up, generator systems fail, etc. And your reputation for building dependably performing engines (or operating them) starts down the hill. It's not your fault, but what can you do?

Plenty—you can install Rochester TELLITE Visual Warning Systems. New, unique TELLITE gives operators a virtually fool-proof warning when trouble *begins—before damage is done.* A pilot light glows steadily under normal conditions. But when something happens—Wham! . . . That light starts flashing brilliantly.

TELLITE gives the initial warning of trouble ahead. ROCHESTER GAUGES accurately and dependably indicate where the trouble lies—before it's too late. Whatever your instrument problem, the chances are a standard ROCHESTER gauge can handle it. Write ROCHESTER MANUFACTURING COMPANY, 34 Rockwood Street, Rochester 10, New York.

ROCHESTER
MANUFACTURING COMPANY, INC.
DIAL THERMOMETERS GAUGES AMMETERS

ROCHESTER DEPENDABLE ACCURACY GAUGES

Field Notes

Truck Line Expansion

Pacific Intermountain Express put a fleet of thirty new GMC Model 740, 150-hp. diesels into service within a 48 hour period recently. Units will replace 81 leased tractors formerly employed by the company on its routes between Kansas City and Chicago and Kansas City and St. Louis. Total cost of the new equipment was in excess of $350,000. In connection with the transition from leased to company-owned equipment program, P-I-E paid out over $600,000 for the purchase of 73 of the leased units formerly utilized by the company. The older leased equipment will be integrated into the system and surplus power units will be sold. The drivers of the owner operated leased equipment, purchased by the company, have been retained on the P-I-E payroll.

The principal advantage of the change to P-I-E, company officials announced, aside from the company's ability to maintain and operate its tractor equipment more economically than leasing, is power utilization. With owner operated leased equipment each driver stays with his equipment and when he rests, the equipment also is idle. One on company-owned operation tractors are driven by driver relays and make a fast turn-around at terminal points. In this manner maximum utilization is obtained and, although the same number of drivers is required, less than half as many tractors are needed.

G-E Plant Extension

A major addition to General Electric's Schenectady, N. Y. turbine plant will be built in a move aimed at boosting the factory's annual output of fuel-fired generating capacity by more than 1,250,000 kilowatts. The extension will add more than 80,000 square feet to the million-square-foot structure. Total estimated cost will be approximately $6,500,000.

The major aim is to incorporate all major steam turbine manufacturing facilities into one building structure. This will enable the company, it is believed, to produce approximate 73 turbine generators, representing 5,500,000 kilowatts annually.

GMC Mobile Diesel Truck School

Since last December four mobile General Motors Corporation truck service schools, traveling throughout the United States and Canada have trained 740 diesel truck mechanics. The program calls for 1500 diesel mechanics and the establishment of 1000 diesel service stations by the end of 1951. The mechanics trained include 462 dealer personnel, 97 company personnel and 135 trucking companies' personnel.

The mobile schools give five-day courses on the 2-cycle GM diesel to experienced gasoline mechanics.

Diesel Summer School — 12 Spar—

The Texas Company Laboratories at Beacon, New York, are making their research facilities available for a five day course on diesel fuels and lubricants, starting June 25, 1951. The course will include classroom and laboratory work on the properties, test methods, manufacture and application of diesel fuels and lubricants.

Enrollment will be limited to 15 and will be restricted to college and university professors teaching courses relating to diesel engines. Professors wishing to attend should send their application to the Diesel Engine Manufacturers Association, 1 North LaSalle St., Chicago 2, Illinois. There will be no fee charged.

Westinghouse Expands Sales Facilities

Westinghouse Air Brake Company, Wilmerding, Pa., has established sales facilities in Canada for its air compressors and pneumatic control equipment.

Canadian Westinghouse Co., Ltd., Hamilton, Ontario, will handle the line, to be used for oil rigs, marine vessels, and general industrial applications.

New I-H Building

International Harvester has recently announced the letting of most of the major contracts for the construction of a new building which will house a service parts depot and a general sales district office and warehouse in Denver. The project will cost approximately $1,500,000.

Construction will start immediately, and the project is hoped to be completed in the latter months of 1952. The new building will be a one-story structure and will contain approximately 181,000 square feet of floor space. The new district office and warehouse will replace the present general sales district office. The service parts depot will be an entirely new facility in Denver.

Machinery Dealers' Convention

On May 31, 1951 and June 1, 1951 the Machinery Dealers' National Association held its Annual Convention at the Drake Hotel in Chicago. There were gathered dealers in used metal working machine tools from all over the United States, as well as some from foreign countries.

In addition to formal meetings devoted to price controls, government regulations, industry standards, etc., the Convention was addressed by government representatives of OPR, NPA and The Department of Commerce.

Borg-Warner Open House

Open house at the Chicago Works of the Ingersoll Products Division of the Borg-Warner Corporation was held May 9th and 10th. Operations of the Chicago plant were viewed, by more than 6000 people.

New Eutectic Administration Building and Welding School

A new administration building has been constructed by Eutectic Welding Alloys Corporation at Flushing, New York to consolidate and house existing branches of the company in the New York metropolitan area, including the general and executive offices and the new Welding Institute.

New Sales and Service Branch for F-M

Another new sales and service office for Fairbanks, Morse and Co. has recently been completed in Cleveland, Ohio. This is the sixth such office to be opened in the present plan of expansion.

The new structure has an area of about 30,000 sq. ft. and cost approximately $300,000. The building includes not only the Cleveland Branch Office, but also a modern diesel repair shop, completely equipped scale shop for repairing scales, large warehouse, repair parts department and display floor.

New Graver Representative

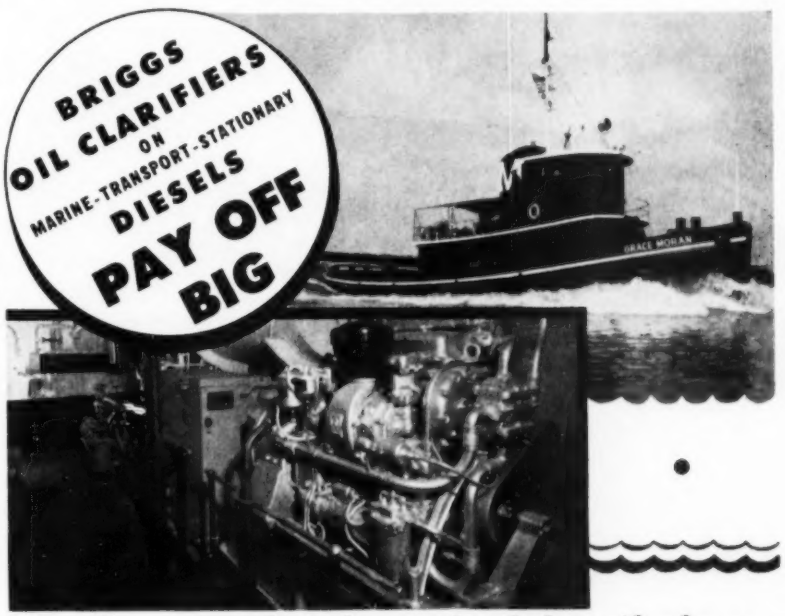
Graver Water Conditioning Company announces the appointment of Flagg, Brackett & Durgin, Inc. as its New England representative.

This concern has specialized in engineering sales work on power plant equipment for approximately thirty years, and represents several prominent manufacturers of equipment for power plants, oil refineries, chemical process plants, etc.

New Swartwout Sales Office

The Swartwout Company, manufacturer of power plant and industrial ventilating equipment, has recently established a new company-operated sales office in Detroit.

Director of power plant equipment sales for the new office, which will service southeastern Michigan, is Kenneth P. Hengesbach, former power plant equipment sales engineer for the Philadelphia office.



. . . because they keep the lube oil clean— physically and chemically

THE GRACE MORAN

The "GRACE MORAN," other Moran tugs and many other vessels, power plants, railroads and transport lines have proved over the years that Briggs Oil Clarifiers improve engine performance by keeping lube oil clean.

BRIGGS offers the RIGHT FILTER for every diesel engine.

PROVE IT YOURSELF

Send us a sample of your oil and engine specifications. We will gladly make a laboratory test and give you our engineers' recommendation—no obligation, of course.

A Briggs Catalog belongs in your file—write for one NOW!

BRIGGS CLARIFIER—MODEL CD
(Filter, Strainers and Oil Storage Tank—in one unit)

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RIVER ROAD, WASHINGTON 16, D. C.

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FOR MORE THAN A QUARTER CENTURY

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● You'll talk to a *tool man* when you get your Snap-on branch on the wire. He'll understand your wants clearly, and help you select the most efficient tools for your needs. You'll get professional tools of the finest character — properly designed, strong, versatile, *safe,* Snap-on Tools—that will serve you long and well. For 30 years, plants—large and small—have used and endorsed this "time-saving way to buy time-saving tools." May we send you copies of the latest Snap-on Industrial and General Catalogs? Write—

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8064-F 28th Ave., Kenosha, Wis.

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Brooklyn 25, N. Y., 1649 Bedford Ave.
Buffalo 13, N. Y., 628 W. Utica St.
Charlotte 6, N. C., 915 S. Clarkson St.
Chicago 16, Ill., 2023 Michigan Ave.
Cincinnati 6, Ohio, 705 E. McMillan St.
Cleveland 15, Ohio, 2912 Euclid Ave.
Dallas 1, Texas, 2932 Commerce St.
Denver 3, Colo., 1050 Broadway
Detroit 2, Mich., 93 Piquette Ave.
Edmonton, Alberta, 10232 103rd St.
Fargo, N. Dak., 421 N. P. Ave.
Houston 3, Texas, 1810 LaBranch St.
Indianapolis 2, Ind., 848 Fort Wayne Ave.
Jacksonville 6, Fla., 1602 Walnut St.
Kansas City 2, Mo., 3635 Main St.
London, Ontario, 111 Mt. Pleasant Ave.
Los Angeles 14, Calif., 1717 W. 6th St.
Milwaukee 3, Wis., 2600 W. State St.
Minneapolis 3, Minn., 1218 Harmon Place
Montreal 15, Quebec, 751 Jean Talon St., West
Newark 6, N. J., 823 Sandford Ave.
New Orleans 13, La., 1040 Camp St.
New York 56, N. Y., 397 East 167th St.
Oklahoma City 3, Okla., 901 N. Hudson St.
Omaha 2, Nebr., 109 S. 24th St.
Philadelphia 30, Pa., 1710 Fairmount Ave.
Pittsburgh 8, Pa., 7007 Kelly St.
Regina, Sask., 2070 Albert St.
Richmond 20, Va., 1617 West Broad St.
San Francisco 2, Calif., 635 Golden Gate Ave.
Seattle 22, Wash., 1501 Olive Way
St. Louis 3, Mo., 2647 Washington Blvd.
Syracuse 3, N. Y., 323 Irving Ave.
Toledo 6, Ohio, 2932 Monroe St.
Toronto 17, Ont., 130 Laird Drive
Vancouver, B. C., 1043 Davie St.
Winnipeg, Manitoba, 238 Garry St.

***Foremost* IN HAND TOOL ENGINEERING, MANUFACTURE, DISTRIBUTION**

Metal Carbides Expands

Metal Carbides Corporation, Youngstown, Ohio, is building an 8000 sq. ft. addition to their plant, making total manufacturing area 35,000 sq. ft. Office space is being doubled.

Over $100,000 of new equipment, including electric furnaces, machine tools, powder mixing and crushing equipment is being added.

These improvements will expand production of Talide tools, tips, dies, rolls and wear resistant parts by over 50 per cent as well as provide additional facilities for producing special tungsten carbide products for the defense effort.

Binks Representative

The Richard S. Dawson Company of Los Angeles has been appointed as California representative for the Cooling Equipment Division of the Binks Manufacturing Company. They will handle the full line of natural and mechanical draft cooling towers, heat exchange coils, and industrial spray nozzles.

Vapor Steam Generator Explained

Operation of the vapor steam generator, which heats and cools railroad cars was explained at a recent meeting of the Southeastern Railway Diesel Club in Jacksonville, Florida.

Virtually all diesel locomotives carry a small vapor steam generator in the engine units. It burns the same fuel oil as the diesel engine in a compact unit which can make enough steam within two minutes after it is fired up to fill the radiator tubes throughout the train. In warm weather steam from the generator powers the air conditioning units in each car. The steam power is used to create a high vacuum in which water for the air cooling system can be brought to a low temperature.

It was said that, although about half of today's streamlined passenger cars are cooled with steam power, virtually all diesels use the vapor steam for heating.

I-H Exhibit

International Harvester recently opened a historical exhibit entitled "Panorama of Progress" in its general office building in Chicago. The theme of the exhibit is "Production Means Progress", and it is designed to educate visitors about farming methods and the use of farm machinery.

Featured is a cutaway model of the UD-24 diesel power unit, used to power the 20-ton TD-24 crawler tractor.

U. S. Vice Pres. at World Oil Congress

Frank M. Porter, president of the American Petroleum Institute, has been named the American vice president of the Third World Petroleum Congress to be held at The Hague, Netherlands, May 28 to June 6, 1951.

Porter was named to his executive post by the organizing committee of the Congress. The group had previously appointed him to the international meeting's Committee of Honour.

GM Insures Material Supply

GM recently took two steps to guarantee a part of its future requirements for basic metals.

The first of these was the announcement of a plan to build an aluminum casting foundry on a site adjoining the primary aluminum plant of the Reynolds Metals Company at Jones Mills, Ark. The new foundry, which will be operated by the Fabricast Division of GM, will receive hot molten aluminum directly from the Reynolds plant. This is the first instance of a transfer of hot metal from a producer to a consumer.

The second step was the granting of a $40,000,000 loan to the Republic Steel Corporation for the latter's expansion program in the Cleveland district.

The steel loan was the second such arrangement by GM in the last five months. In the fall Jones and Laughlin Steel Corp. obtained $28,000,000 for its expansion program. In both instances the interest rate is 3 per cent and provision has been made for repayment in steel products.

EVERY Leece-Neville PRODUCT

A Gilt Edged Investment

For over 40 years Leece-Neville Generators, Cranking Motors, Regulators, Relays and Switches have set the standards on Buses, Trucks and Cars...wherever rugged construction and better than average performance is required.

NOW ANOTHER L-N BLUE CHIP INVESTMENT

A Leece-Neville Alternator continues to pay dividends long after the car or truck on which it was first installed has gone to the junk yard. The Leece-Neville AC-DC Alternator System delivers **25 to 35 amperes with engine idling...** saves batteries, gas, oil, engine wear. There are L-N Alternators rated at 50 to 175 amps. Practically a lifetime unit, the L-N Alternator can be shifted to a new vehicle every time the old one is traded in. For all the facts, write The Leece-Neville Company, Cleveland 14, Ohio.

Leece-Neville

order it . . .

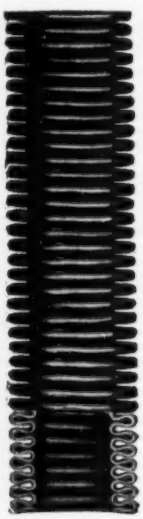
install it . . .

forget it . . .

You can do that with ATLANTIC seamless diesel hose which requires no maintenance whatever.

Absolute uniformity of wall thickness . . . no seams or packed joints . . . absolutely tight against water, oil, steam, gas, air . . . dampens vibration . . . . maintains flexibility at extremely high temperatures.

Bronze, Steel, Stainless Steel, Monel — ⅛"—36" I.D. with fittings as needed.



Diesel Bulletins 1020 & 50A furnish complete information.

See our Catalog in Sweet's File for Product Designers.

ATLANTIC

METAL HOSE CO., INC.

109 West 64th St.,

New York 23, N. Y.

Standco Makes Clutch Facings

Standco Brake Lining Company of Houston has now entered the clutch facings field.

They are producing and marketing a new heavy-duty clutch facing in both the gear tooth and plain discs types for use in the oil production, marine, earth-moving and heavy transportation equipment industries. On the strength of existing and anticipated industrial and military requirements, the company plans to triple its present facilities for the production of clutch facings as soon as necessary new equipment can be installed.

Gould Battery Plan

Gould National Batteries, Inc. recently announced a plan devised to help industrial battery users get the maximum power and life from their batteries for extra defense production during lead cut-backs. Issuance of the various government shortage materials orders, including NPA lead conservation order M-38 makes it increasingly evident that industry must make those materials on hand last longer and produce more.

The "Plus-Performance Plan" consists of the availability of applicable charts, manuals, and articles pertaining to particular users' problems. The company estimates that battery performance can be improved as much as 50 per cent if four major rules are practiced properly: selection, charging and handling, maintenance, and determination of condition.

The material contained in the plan can be obtained by addressing a request to the firm at Trenton 7, N. J., stating (1) the kind of battery service in which you are interested, and (2) the points on which you desire information. A special individualized portfolio will be made up covering the technical information desired in the indicated field. Should specific questions be asked concerning special problems, the engineering staff will prepare an individualized study and recommendations. Finally, a request on a special field problem will bring field engineers to inspect the batteries themselves without obligation.

THOMAS

Flexible **ALL METAL COUPLINGS**

FOR POWER TRANSMISSION REQUIRE NO MAINTENANCE

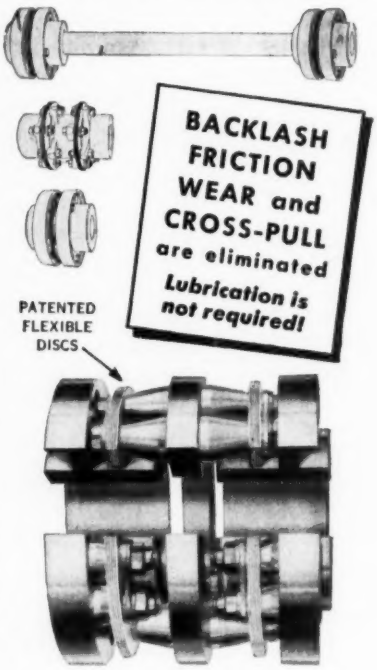
Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:

½ to 40,000 HP

1 to 30,000 RPM

Specialists on Couplings for more than 30 years



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT.

NO MAINTENANCE PROBLEMS.

ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

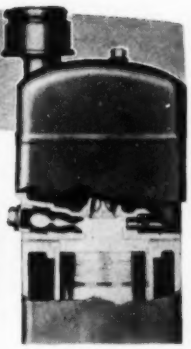
Write for the latest reprint of our Engineering Catalog.

THOMAS FLEXIBLE COUPLING CO.

WARREN, PENNSYLVANIA

Designed for top diesel performance

LANOVA COMBUSTION SYSTEM



Look for the distinctive Lanova combustion chamber design in your next diesel — it's a sure guarantee of —

- High combustion efficiencies
- Topnotch operating economy
- Smooth, quiet operation
- Clean exhaust
- Easy starting

You'll find The Lanova System only in diesels manufactured by Lanova licensees. Their names will be furnished on request.

Lanova Corporation
38-19 30th St.
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Lanova ...adopted and approved by leading diesel builders

TAC does what no other tool can do!

AT LAST! AN OPEN-END RATCHET WRENCH — the world's first true *universal* wrench. A patented design for connections on tubing, rods, piping, conduit, studs, etc. Sixty-four socket sizes from ⅜" to 4". Smallest effective ratcheting arc yet — 5° to 7½°. TAC will also do every job any ordinary ratchet wrench will do: one TAC set replaces literally dozens of single-purpose hand tools.

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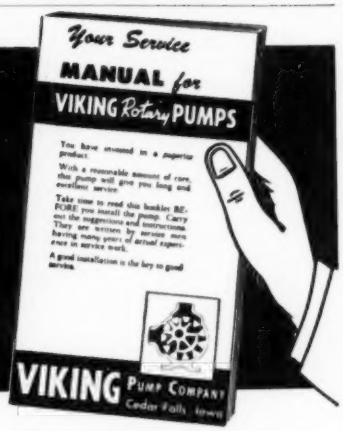
HELP YOURSELF To More and Better PUMP SERVICE



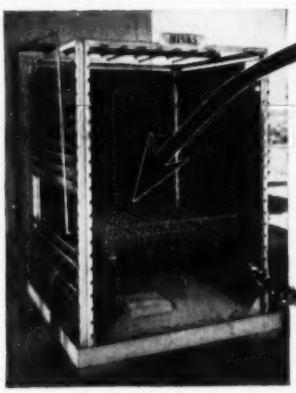
With this illustrated booklet, you can help yourself to more efficient, economical service from your Viking Rotary Pumps. Although Vikings are rugged, they are also valuable, precision-built pumps that serve better with proper installation and care. Now that defense needs require part of our production, prompt replacements may be delayed. We strongly urge, therefore, that users follow instructions in this FREE manual to help maintain longer service from your Viking Pumps.

VIKING AN HONORED NAME IN PUMPING

FOR YOUR COPY, JUST CLIP THIS AD AND SEND IT TO

See Our Catalog in SWEET'S

Viking Pump Company
Cedar Falls, Iowa



Binks closed-type
DIESEL COOLING SYSTEMS

A Binks natural draft cooling tower with louvers removed to show Binks closed-type evaporative heat exchange coils.

Increased and more uniform heat transfer

Binks Type "D" evaporative heat exchange coils assure Diesel operators uniform...economical engine performance. Two-way cooling by "evaporation" and "convection" plus higher velocity of hot jacket water inside coils gives increased heat transfer. Scale formation in engine jacket is prevented since jacket water never mixes with raw cooling water. Breakdowns are reduced; insurance cut.

Send for Bulletin 41. Obtain full information—drawings, tables—on heat exchange coils adaptable to a variety of operating conditions.

Binks MANUFACTURING COMPANY
3114-38 Carroll Ave., Chicago 12, Ill.
REPRESENTATIVES IN ALL PRINCIPAL CITIES

Arcos' New West Coast Office

Arcos Corporation, manufacturer of stainless, low alloy high tensile and non-ferrous electrodes, Philadelphia, announces the opening of a West Coast office and warehouse in Los Angeles. The office will give service on the line of welding electrodes. Mr. B. E. David has been appointed district manager.

Willard Sales Trophy

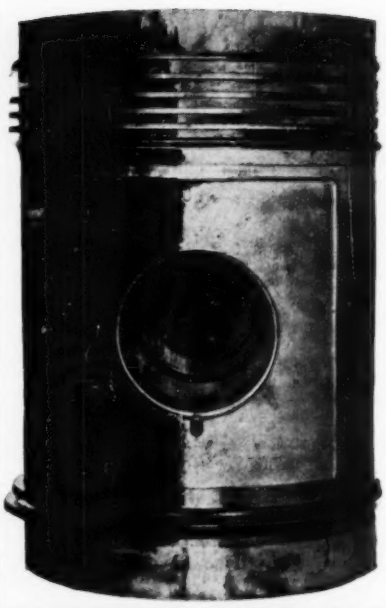
A sterling silver trophy which has been presented annually to members of the outstanding sales district of the Willard Storage Battery Company for more than 35 years, was received this year by H. C. Negus, district sales manager of the Cleveland Territory for his group's sales performance during 1950. District sales representatives who are members of the winning team are: E. V. Burnett, L. E. Chappell, W. B. Cleveland, E. G. Shaw, R. E. Maddox, and R. T. Snedden.

Conservation of Parts

Today, conservation of serviceable parts in the heavy equipment industry is vitally important. Many dealers are surveying their service facilities for methods of lowering reconditioning costs and reducing parts shortages.

For a number of years, manufacturers alone have been using the submerged arc welding process in the fabrication of structural members. Essentially the same as the more familiar arc welding accomplished by hand, the submerged arc process uses bare (uncoated) wire electrodes producing an arc with the base metal under a protective covering of molten flux. In either instance the molten metal is protected from the atmosphere.

Now that conservation has entered the picture again, automatic welding machines have entered the fields of repair and reconditioning. Simplified controls and elimination of costly fixtures has reduced the price to the point where many dealers can profitably afford the investment.



Decarbonize Aluminum Pistons FASTER!

Removing products of combustion from aluminum pistons, piston rings, connecting rods can now be done *faster, easier,* more economically with Oakite Composition No. 61. Safe to surfaces, used in cold solution form, Oakite Composition No. 61 quickly removes dirt, oil and carbon... leaves clean surfaces for speedy, accurate inspection before engine repair or overhaul.

Technical Data is FREE

You can get step-by-step directions on decarbonizing steel and aluminum pistons merely by writing address below. Or, if you prefer, on-site service is freely available to handle this work or any other Diesel maintenance cleaning operation necessitating immediate action. Consult Oakite today!

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New Link-Belt Plant

Link-Belt Company has recently started construction of an engineering and manufacturing plant for the production of elevating, conveying and processing machinery, on a 43-acre site at Colmar, Pa., on the Doylestown branch of the Reading Railway. It will supplement existing facilities at Nicetown, Philadelphia.

The new plant is designed for efficient straight-line manufacture from the receiving department at one end of an 880-ft. long building to the shipping department at the other end. It will contain approximately 300,000 sq. ft. of floor space, including a two-story office building and a modern cafeteria. The layout allows for future expansion to double the initial size.

Organizational News

Nordberg Transfer

William C. Young, left, Nordberg Manufacturing Company sales engineer, has been transferred from Milwaukee to the Washington D. C. office. Joseph M. Monroe, right, will assume the duties of sales engineer in Milwaukee.

Mr. Young is a graduate of Marquette University. He joined the company's Heavy Machinery Division in 1943, specializing in diesel engine applications. After serving in the Navy, he returned as a sales engineer in the 4-cycle diesel department of the Heavy Machinery Division.

Mr. Monroe has his Master's degree in mechanical engineering from North Carolina State College. He last served the company as an installation engineer.

Allis-Chalmers Elections, Appointments

The board of directors of Allis-Chalmers Manufacturing Company recently re-elected W. A. Robers as president, and elected a new vice president, Boyd S. Oberlink, who has been serving as assistant to the vice president in charge of the tractor division. He will continue to serve in that capacity.

W. A. Yost has been appointed head of a new mechanical power department. He has been manager of the steam turbine department since 1947.

J. F. Roberts is the new director of engineering. He has been head hy-

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cost you less!

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MODEL: M90016 Muffler
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CONDITION: Cut-away reveals internal and external parts in good condition.

Over 103,000 miles and still in good shape! That's what engineers found when they removed this Donaldson Muffler from a 300 HP Diesel truck engine, picked at random on a West Coast Highway. Examined in the Donaldson laboratory, the muffler was found to be sound and free from structural weaknesses.

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Model M01201 Oval-Type for Under-chassis installations. Dimensions: 10" x 15" oval, 25" body length, 4½" I.D. sleeves.

Dimensions Model M90016 vertical cab-mount muffler: Diameter 9", body length 45", I.D. sleeves 4½".

DONALDSON COMPANY, INC.
666 Pelham Blvd., St. Paul 4, Minn.

Donaldson Mufflers

draulic engineer for the Tennessee Valley Authority, and has served a good many years for the company, his last post being manager of the hydraulic department.

R. C. Allen has been appointed consulting engineer. He served last as manager and chief engineer of the new turbopower development department, and has developed many of the World War II projects in which the company participated.

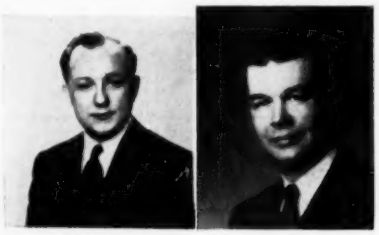
GM Promotion

Ralph B. Knight has been appointed general manager of the Rochester Products Division of General Motors. He succeeds Thomas L. Lee, who retired after serving as general manager since the division was organized in 1939.

Mr. Knight became assistant general manager of the division last June, after serving 11 years as works manager.

Purolator Vice Presidents

Purolator Products Ltd. the Canadian subsidiary of the corporation of Rahway, N. J., recently elected H. Joseph Markert, left, and Albert E. Bell, right, both of New Jersey, as vice presidents.



Mr. Markert, in addition to being vice-president, will serve as a director of the Canadian plant. Mr. Bell becomes vice president in charge of operations.

Borg-Warner Director

Edmund F. Ball, president of Ball Brothers Company, was recently elected to the board of directors of Borg-Warner Corporation. He succeeds George A. Ball, his uncle, who has retired.

Mr. Ball has been president of Ball Brothers Company for three years.

Link-Belt Chief Engineer

Link-Belt Company has appointed Robert W. Suman as chief engineer of the Philadelphia plant. He has been chief engineer for power transmission products since 1946, and is now assuming the added responsibility of materials handling equipment engineering, formerly directed by William S. Campbell, who has retired.

Mr. Suman entered the employ of the company at the Caldwell plant in Chicago, upon graduation from Armour Institute of Technology in 1934. He was assistant chief engineer there prior to his transfer to Philadelphia in 1946.

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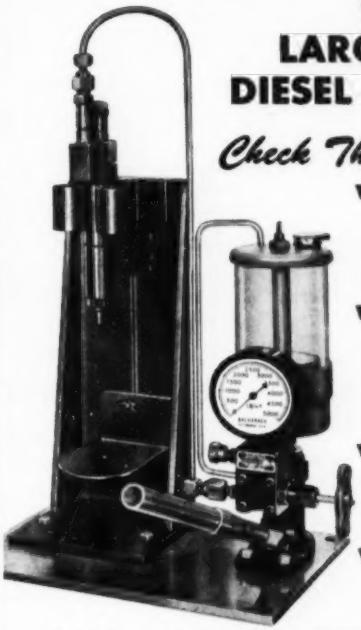

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Great Northern Promotions

Directors of the Great Northern Railway recently elevated Frank J. Gavin from the presidency to chairman of the board. He had been president since 1839.

John M. Budd was elected president. He has become a railway president for the second time in four years, having left Great Northern in 1947 for the Presidency of the Chicago & Eastern Illinois. He returned in 1949 as operating vice president.

Ira G. Pool succeeds Mr. Budd as operating vice president. He was formerly general manager of lines east, headquartering in Duluth.

Swartwout Appointment

The Swartwout Company, manufacturer of power plant and ventilating equipment, recently appointed A. P. Jeffery as power plant equipment sales engineer for the Albany and Schenectady territory, with headquarters in Albany.

Mr. Jeffery is a graduate of Case Institute of Technology, Cleveland.

Van Norman Appointments

Van Norman Company has named Charles R. Crowder, left, vice president and former head of the company's Automotive Division, as the new general manager of the company, replacing former executive vice president Leo Hunderup, who recently resigned.

George Dickinson, right, has been appointed sales manager of the Automotive Division. He has been with the company nearly 20 years as district manager of the Chicago-Milwaukee-Indianapolis territory.

Westinghouse Changes

T. I. Phillips, vice-president of the Westinghouse Electric Corporation and formerly in charge of the East Pittsburgh Divisions, has been assigned to the staff of the industrial products vice-president to help plan and carry out the extensive industrial products expansion program. L. B. McCully has taken over as general manager of the East Pittsburgh Divisions, where Mr. Phillips will continue to make his headquarters. Mr. McCully is to continue also with his present duties as manager of the Transportation and Generator Division.

Mr. Phillips joined Westinghouse in 1915 and one year later was made a foreman. He continued to rise and was elected vice-president in 1941, and took charge of the East Pittsburgh Divisions in 1943.

Mr. McCully joined the company's graduate student training course in 1916. After holding various positions he was appointed manager of the combined Transportation and Generator Division in 1939.

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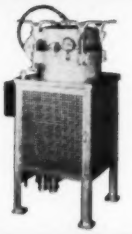

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ASME Elections

George M. Muschamp was elected chairman of the Philadelphia Section, American Society of Mechanical Engineers, at the annual meeting. He is vice president in charge of engineering for Brown Instruments Division, Minneapolis-Honneywell Regulator Company.

Robert W. Worley, United Engineers and Construction, Inc., was elected vice chairman; James A. Quaid, Martin Quaid Company was chosen treasurer; and C. C. Franck, Westinghouse Electric Corporation, was chosen secretary.

Link-Belt Changes

Link-Belt Company recently appointed Mr. Richard Moyer, formerly general superintendent at the Pershing Road plant in Chicago, to the position of general manager of the North Central Division, with headquarters at the Minneapolis plant. He succeeds Mr. Leslie J. Carson, who is the new price executive of Machinery Branch of the Industrial Materials and Manufactured Goods Division of O. P. S., with headquarters in Washington, D. C.

Fred B. Skeates, formerly personnel manager of the Pershing Road plant, has been appointed general superintendent at this plant to succeed Mr. Moyer.

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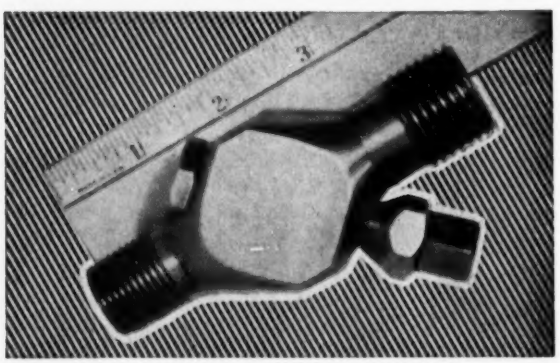

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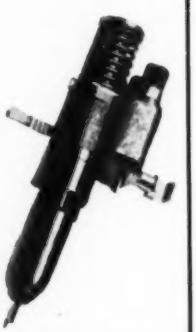

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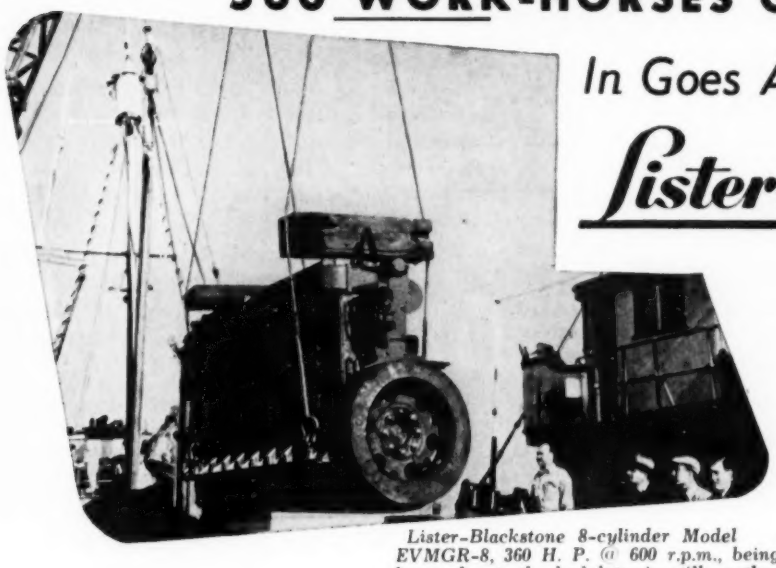

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Honeywell Defense Program

An intensified program for meeting increasing defense requirements has been set up by the Philadelphia industrial division of Minneapolis-Honeywell Regulator Company. The program includes coordinating and expediting of engineering, production and delivery of highly sensitive industrial instruments. The following appointments have been made in connection with the new program.

Marshall B. Taft has been named manager of staff operations. James N. Redpath has been made special assistant to the president of the Brown Division, to serve as liaison man between government and company activities. Henry M Schmitt, industry manager, will devote full time to directing sales in connection with the expanded AEC program. Gordon H. Cole, formerly Washington industrial manager, has been transferred to the government's project office to direct the handling of Navy, Coast Guard and Maritime operations.

Hunt-Spiller Elects

Winfield S. Axford has been elected executive vice president and a director of A. S. Campbell Co. and its Boston subsidiary, Hunt-Spiller Manufacturing Corporation, producer of diesel engine parts.

Mr. Axford started with the company in 1936 as timekeeper, became production manager in 1946, and comptroller and assistant to the president in 1950.

Dieselization Program Engineer

K. A. Truman has been appointed special engineer at Calgary for the Canadian Pacific Railway to act as project manager for the Calgary-Revelstoke dieselization program approved for the present year. (See Diesel Briefs.) Since last October he has been special engineer at western engineering headquarters in Winnipeg. A graduate of University of Manitoba, he joined the road first in 1929.

Replacing him at Winnipeg is J. M. MacBride, who has been assistant engineer of track at Montreal since 1944 and who joined the C. P. R. in 1939 on graduation from the University of New Brunswick.

Fram Vice President

Henry T. Parrett who has represented the Fram Corporation in Washington in the capacity of manager for the last ten years, has been elected vice-president. Mr. Parrett was with the Dodge and Graham Paige Corporations for fifteen years prior to joining Fram and has over a quarter of a century experience in the automotive industry.

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Borg-Warner Promotions

Appointment of G. E. Campbell as assistant works manager and of Donald A. Sutherland as industrial sales manager has been announced recently by the Borg-Warner Corporation. Mr. Campbell formerly was manufacturing consultant in the central offices in Chicago.

Mr. Sutherland previously was Pesco's industrial relations manager.

E. J. Foltz, formerly Mr. Sutherland's assistant, has been promoted to the post of industrial relations manager.

Union Carbide Executives

Fred H. Haggerson, president of Union Carbide and Carbon Corporation, has also been elected chairman of the board of directors. He has been president of the corporation since 1944, and has been associated with it for over 30 years.

Morse G. Dial has been elected executive vice-president. A graduate of Cornell University, he joined the corporation in 1929, and since 1949 has been director, vice-president, and treasurer.

Dr. George O. Curme, Jr. has been elected vice-president in charge of research. Since 1948 he has been vice-president in charge of chemical research, and for many years a vice-president of Bakelite Company, and Carbon Chemicals Company, both divisions of the corporation.

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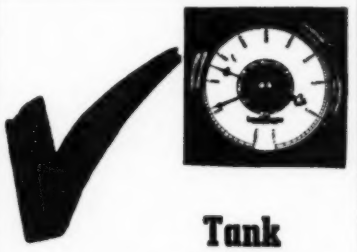

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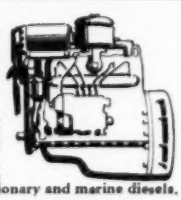

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Worthington Sales Manager

Mr. A. F. Reinking, formerly assistant sales manager, has been named manager of the Steam Turbine Sales Division of Worthington Pump and Machinery Corporation, with headquarters at the Wellsville plant.

Mr. Reinking was graduated from Rose Polytechnical Institute with a degree in mechanical engineering, then completed the corporation's student training course in 1927, and was assigned to the New York district office. In 1929 he joined the Moore Steam Turbine Corporation, but again became associated with Worthington when it purchased that corporation in 1936.

G-E Appointment

William W. Kuyper has been appointed engineering manager of the Knolls Atomic Power Laboratory, which is operated by the General Electric Company for the Atomic Energy Commission. He will be responsible to Dr. Kenneth H. Kingdon, technical manager, for all of the engineering activities of the laboratory, which consist mainly of the design and construction of an atomic power plant for submarines.

Mr. Kuyper has a B. S. in electrical engineering and an M. A. in physics. He was formerly divisions engineer of the Steam Turbine, Generator and Gear Engineering Divisions of the G-E Lynn River Works.

Bendix Chief Engineer

Leonard O. Mjolsnes has been promoted from assistant chief engineer to chief engineer of the Diesel Equipment Section of Scintilla Magneto Division, Bendix Aviation Corporation, filling the vacancy resulting from the death of A. T. Bremser.

Mr. Mjolsnes joined the firm in 1947. Prior to this time he was employed by Baldwin Locomotive Works and the Detroit Diesel Engine Division of General Motors. His experience in the diesel engine field includes research, design and application of both 2- and 4-cycle engines of marine, stationary, vehicle and railroad types.

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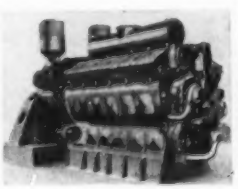

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Zallea Expansion Joint News

PUBLISHED BY ZALLEA BROTHERS—WORLD'S LARGEST MANUFACTURERS OF EXPANSION JOINTS

Expansion Joint of the Month

GENERAL DESIGNS

Zallea Stainless Steel Flexible Connectors are available in two general designs. Figure 15, which has a small corrugation, is made in sizes 4″ to 10″ inclusive. Figure 8 has a much larger corrugation, similar to that used in Zallea Non-Equalizing Expansion Joints, and is made in sizes up to 72″ diameter.

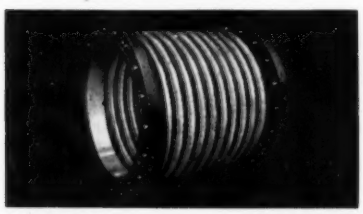

Figure 8

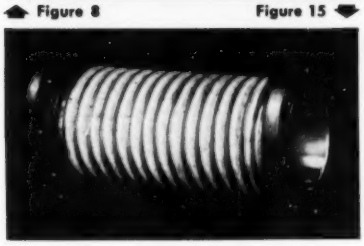

Figure 15

Figure 8 Flexible Connectors are designed to absorb $\frac{1}{4}$″ axial movement (5″ diameter and smaller $\frac{3}{16}$″) per corrugation up to a maximum of $\frac{1}{2}$″ traverse with open pitch corrugations and up to a maximum of 3″ traverse with close pitch corrugations. Figure 15 Flexible Connectors are designed to absorb .083″ axial movement per corrugation up to a maximum of $\frac{1}{2}$″ traverse with open pitch corrugations and up to a maximum of 2″traverse with close pitch corrugations.

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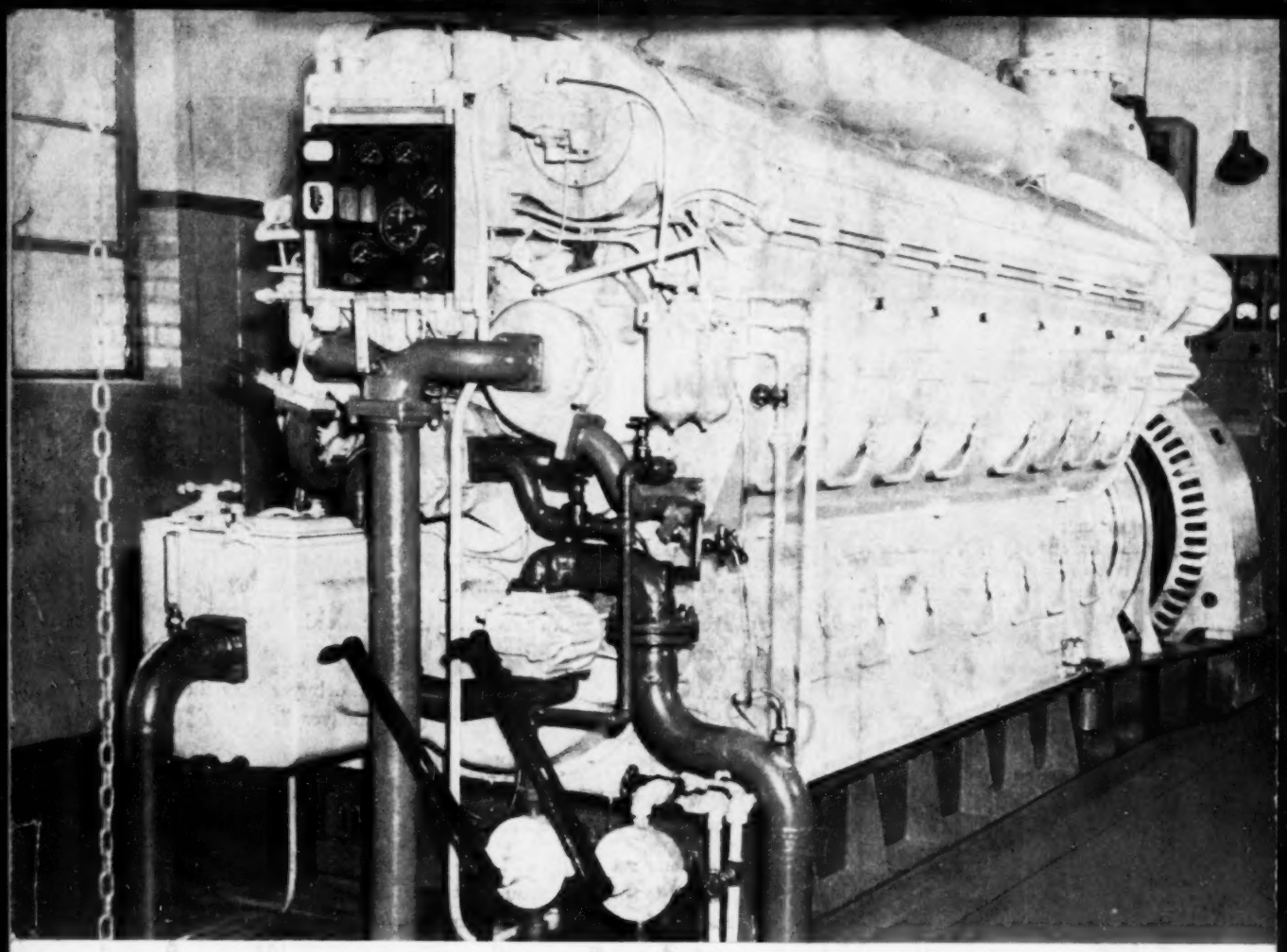

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